Aug. 1930

Electrical Manufacturing

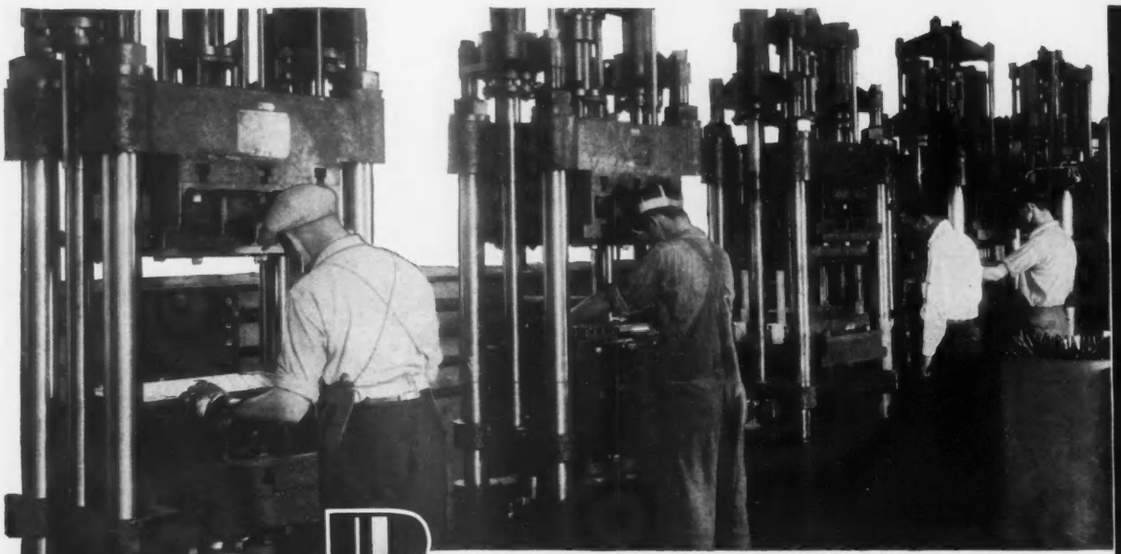
Vol. 6 A Gage Publication No. 2

ANACONDA
from mine to consumer
REG. U.S. PAT. OFF.

The Symbol *of* Leadership!

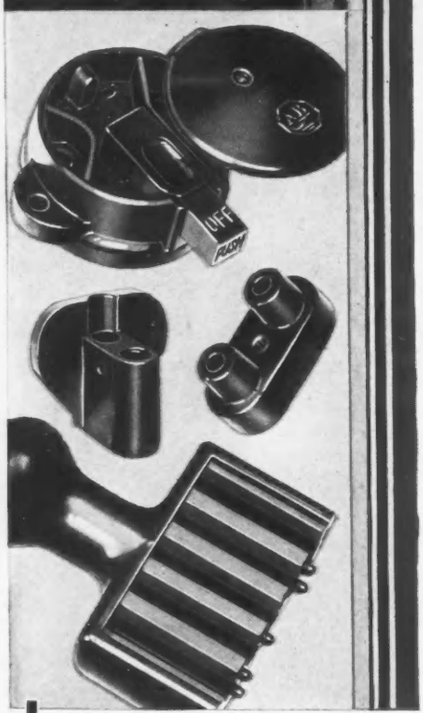
No matter what the electrical requirements may be, wires and cables that bear the Anaconda name and trademark are the standard of quality.

ANACONDA WIRE & CABLE COMPANY
SALES OFFICES IN PRINCIPAL CITIES
General Offices: 25 Broadway, New York City
Chicago Office: 20 North Wacker Drive Building



Beldenmold Parts for Every Service

molded in modern high-speed presses



Use Beldenmold parts of Bakelite, Durez and similar materials to improve the appearance and performance of your finished products. Screws, studs, holes, projections and irregular recesses can be molded so accurately and with such perfect finish that additional machining is not required.

Trade marks, patent numbers or any other descriptive lettering or decorative features can be molded. Standard colors such as black and brown or special colors, opaque or translucent, can be produced.

By replacing wood, metal, rubber, porcelain, glass, and cold molded parts with Beldenmold parts, you are assured of maximum uniformity, minimum labor in assembling, and consequently lower cost. Send us samples or blueprints of any parts now used or contemplated in your products and let us quote you.

A new enlarged Belden plant assures prompt service.

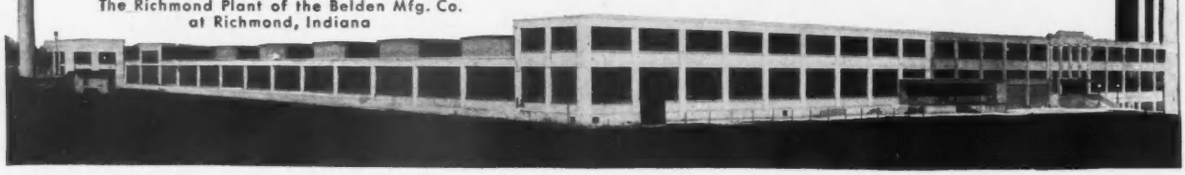
Belden Manufacturing Company, 4633 W. Van Buren St., Chicago

Belden

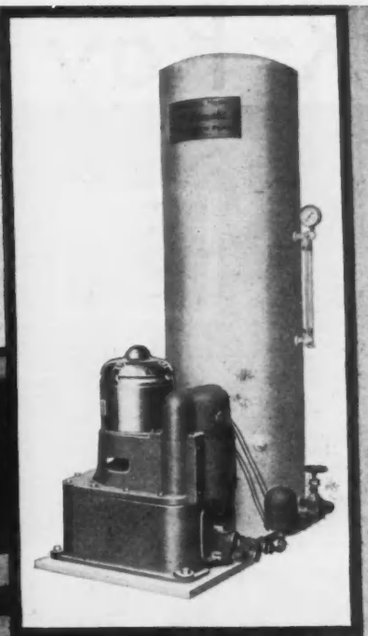
Belden Products

Beldenamel and Textile Magnet Wire • Beldenmold Parts • Coil Windings • Automotive Wires and Cables • Airplane Assemblies • Radio Wires, Cords and Cables • Rubber Covered Wires • Armored Cables • Flexible Armature Wires • Motor Lead Wires • Braided and Stranded Copper Cables • Cotton Sleeving

The Richmond Plant of the Belden Mfg. Co. at Richmond, Indiana



IN HARMONY
with the Form and Function of the Machine it Drives



It is a Master principle that the motor, whenever possible, should become an integral part of the machine. *Special problems* in motor application often give Master engineers the opportunity to make *extraordinary* contributions to the beauty, symmetry, compactness and safety of the complete device produced by a manufacturer. Efficiency has been increased and production costs lowered by inexpensive changes in the method of mounting or applying the motor. The above application is an example. Master engineers would welcome the opportunity to study such possibilities in connection with your product, without obligation to you.

THE MASTER ELECTRIC COMPANY
DAYTON, OHIO

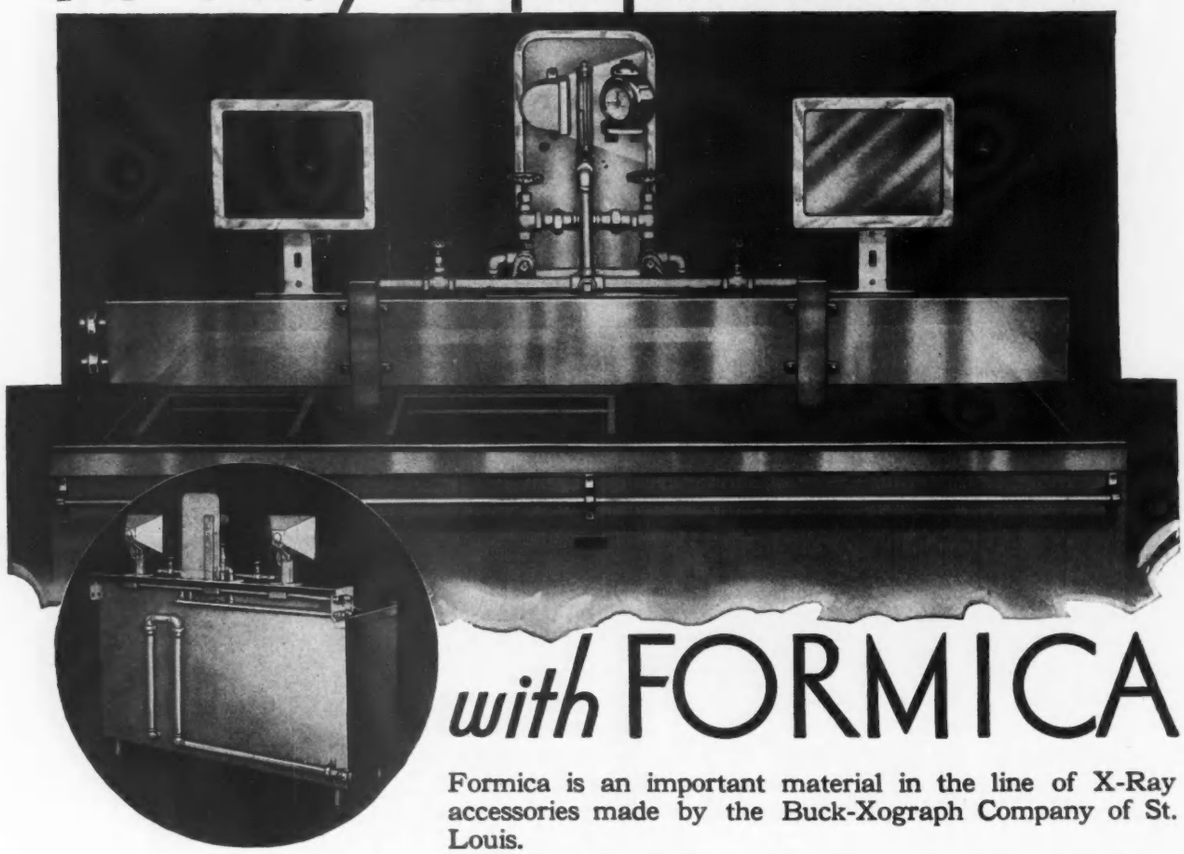
STOCKS CARRIED IN PRINCIPAL CITIES

MORE THAN 100 SERVICE STATIONS

MASTER GUARANTEED MOTORS

1/20 TO 10 H.P. Dayton THE MASTER ELECTRIC CO. Ohio *Not More Than 40°*

X-Ray Equipment » » »



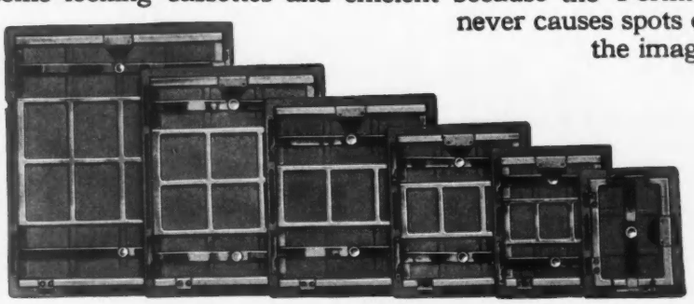
with FORMICA

Formica is an important material in the line of X-Ray accessories made by the Buck-Xograph Company of St. Louis.

The X-Ray developing tank made by this company is used in many leading hospitals, on ships of the United States Navy and by prominent X-Ray Specialists everywhere.

Formica in the marble finishes is used to trim top of this tank because it retains its good appearance although frequently wet by developing solutions.

The company also offers a line of cassettes in which black Formica is used for the slide or cover. These are handsome looking cassettes and efficient because the Formica never causes spots on the image.



FORMICA

THE FORMICA INSULATION COMPANY
4632 Spring Grove Avenue - CINCINNATI, OHIO

SEP 10 1930 ©CLB 86393

Electrical Manufacturing

Reg. U. S. Patent Office

Volume 6 AUGUST, 1930 Number 2

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ELECTRICAL MANUFACTURING'S editorial program has the following objectives:

Production

To help all electrical manufacturers, including makers of motor-driven products, increase the product's salability, cut unit production costs, quicken turnover, reduce overhead expenses, establish standard methods of work, and spread a better knowledge of raw materials and parts.

Marketing

To spread a better knowledge of and aid electrical manufacturers in adjusting sales management to the buyers' market, to aid in making advertising more effective, finding the most profitable distribution channels, and promoting cooperative market development.

Administration

To further the working out of sounder management policies and better executive control, coordinating sales and production schedules, promoting research, and developing better industry relations.

Repairing

To help all motor repair shops to build better business by developing a sounder organization, improving management, policies and methods, and developing a keener merchandising point-of-view on the business.

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INSPECTION

the cue to quality

YOUR PRODUCTS must earn the right to markets which each year are becoming more critical of QUALITY. New models and price reductions will continue to court favor with consumer interest only so long as quality and dependable service are maintained.

The benefits of mass production are cumulative when machine speeds are efficiently regulated, processes carefully controlled and progressive operations accurately checked. Otherwise, wastes quickly multiply, rejections become excessive and production losses vitiate profits.

Checking the manufacture of the product, step by step, with frequent inspections is not only the cue to quality, but the best means of accelerating production, improving deliveries and keeping pace with sales demand.

Manufacturers of radio receivers, tubes and other electrical equipment have told our representatives without reservation that they could not possibly maintain the speed necessary to meet production schedules without the unstinted use of Weston Instruments—particularly the 3¼" diameter panel models which can be employed for the majority of electrical inspection tests.

The unusual electrical characteristics, speed of measurement and dependability of these instruments for bench testing work, their adaptability to every type of service both for panel mounting and portable testing sets, coupled with their low cost, easily make them the outstanding choice

A number of leading companies employ hundreds of these instruments in daily use and manufacturers of radio, therapeutic and general electrical equipment carry stocks of selected ranges constantly on hand, both for mounting on their products and for maintenance and inspection testing. Communicate with our nearest sales office for full particulars, ranges and prices.

3¼" diameter A.C. panel type.

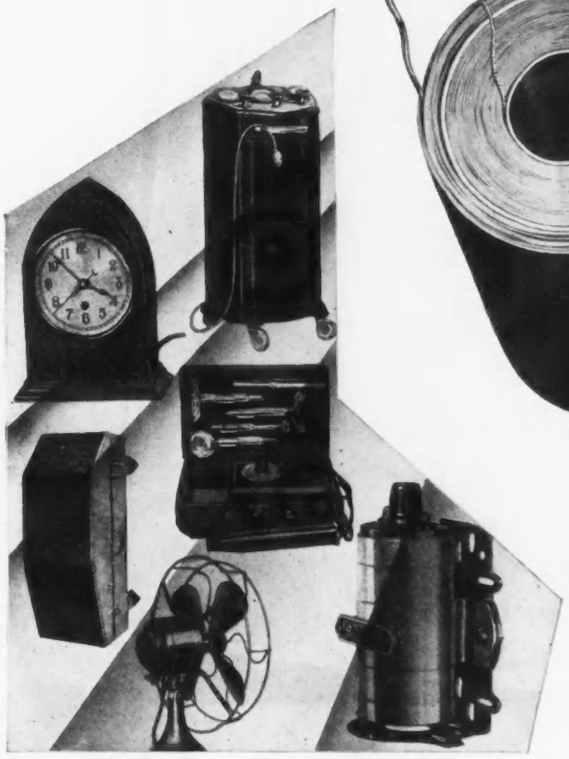
3¼" diameter thermo-couple type.

3¼" diameter D.C. panel type.

WESTON ELECTRICAL INSTRUMENT CORPORATION
582 Frelinghuysen Ave. Newark, N. J.

Weston
PIONEERS SINCE 1888
INSTRUMENTS

The COIL'S *the* THING

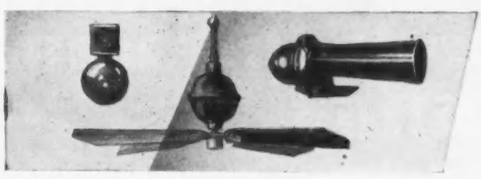


UPON the coil depends the performance of the electrical product. ¶Uniformity of the electrical characteristics of a coil is therefore a matter of prime importance to every manufacturer of electrical appliances. ¶Careful workmanship, careful selection of uniform raw materials, and exacting tests make the electrical characteristics of the Dudlo Coil uniform and also make it dependable . . . a coil built to hold up under actual operating conditions.

FORT WAYNE PLANT FORT WAYNE, INDIANA

GENERAL CABLE CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK • OFFICES IN PRINCIPAL CITIES

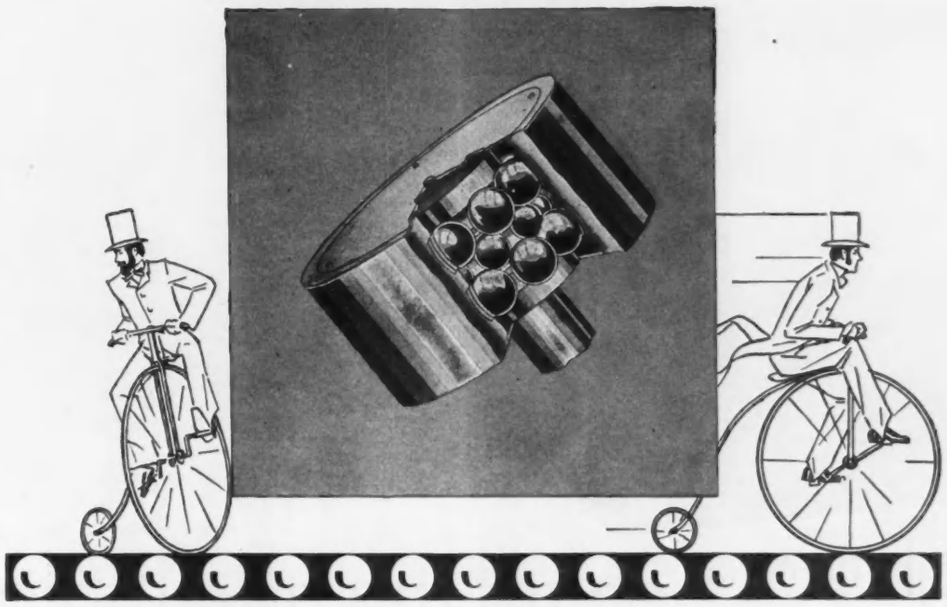


General Cable Coil Engineers have often suggested modifications in coil design which have effected great savings for set manufacturers. This assistance is a regular feature. You are invited to take advantage of it. General Cable Coil Engineers make their headquarters at the Fort Wayne Plant, Fort Wayne, Ind.

Equipped with
SHAKEPROOF
Lock Washers
The Sign of a
QUALITY PRODUCT!
THERE are two kinds of manufacturers: those who build up to a standard and those who build down to a price. The first—even though his product is priced in the lowest range—is constantly striving to improve performance. The second, is only interested in cutting costs and foolishly tries to use inferior parts where he thinks they won't be noticed.
Any manufacturer who uses Shakeproof Lock Washers is providing his product with the best protection against vibration. It is certain to last longer—need less service and give the user real satisfaction. Loose connections, the real cause of most troubles, are prevented by this powerful locking principle.
It will pay you to send at once for free samples of Shakeproof Lock Washers. Test them on your next service job. Then, you will know why Shakeproof equipped products will give your customers greater satisfaction—help you build good will and increase your profits.
Write for your samples today!
"It's the Twisted Teeth that LOCK"
U. S. Patents 1,410,984 1,604,122 — 1,887,954 Other patents pending. Foreign patents.
SHAKEPROOF
Lock Washer Company
(Division of Illinois Tool Works)
2533 North Keeler Avenue, Chicago, Illinois

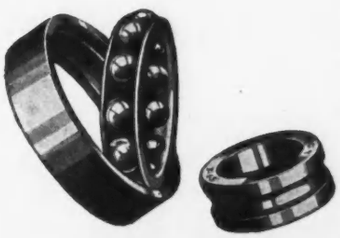
Look! for this advertisement in the August issues of Electrical Merchandising and Radio Retailing

THE WORLD FIGHTS FRICTION



The possibilities of ball bearings in overcoming friction were gradually being explored. Thus, one inventor originated an installation consisting of three sets of balls which turned against each other. This was in 1863—and in a few years the ball bearing was to make possible the 'safety' bicycle.

THE finest steels will not in themselves produce perfect ball bearings. Modern mechanisms require ball bearings of almost incredible accuracy. And that results only from human *craftsmanship.*



Torrington Ball Bearings easily meet the strictest engineering requirements . . . for the Torrington plants are operated by men who have specialized for a lifetime in precision work.

Torrington methods and Torrington men produce ball bearings not excelled for essential accuracy, and economical long life.

DISTRICT SALES REPRESENTATIVES

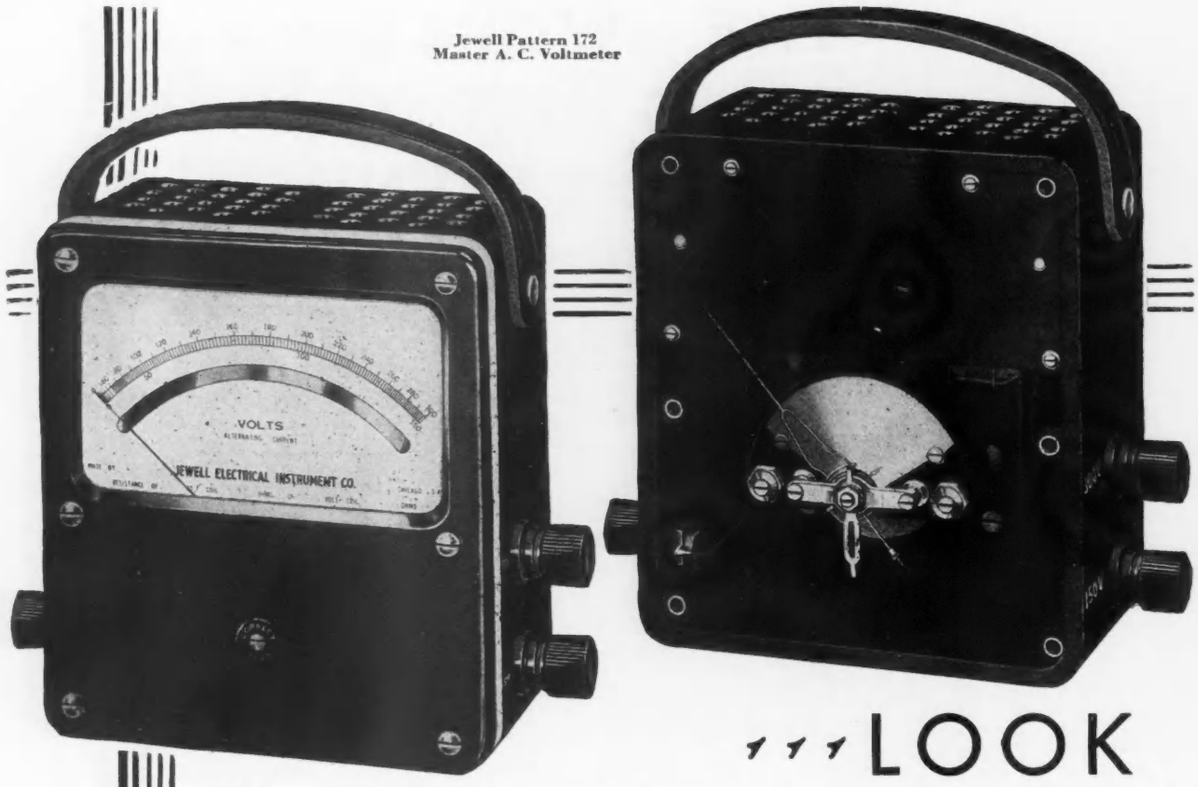
S. W. ANDERSON
565 W. Washington Blvd.
Chicago, Ill.

The TORRINGTON COMPANY
Curtis Building
2842 W. Grand Boulevard
Detroit, Mich.

This is the last of our illustrations "The World Fights Friction"... a history of the development of ball bearings. The originals of many of the illustrations used in this series are in the libraries of France . . . and for the excellent photostatic prints in the New York Public Library we are indebted to "Le Roulement a Travers les Ages," presented by the Compagnie d' Applications Mecaniques.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

Jewell Pattern 172
Master A. C. Voltmeter



LOOK behind the name plate!

The Jewell Pattern 172 A.C. Voltmeter illustrated above is typical of the Jewell Master Line which comprises intermediate size instruments in bakelite cases of uniform dimensions to cover practically every requirement of electrical testing.

Scales much longer than on competitive instruments, large scale openings protected by non-shatterable glass, ½ of 1% accuracy guarantee, and rugged cases of molded bakelite are some of the features which account for the ever increasing popularity of Jewell Master Instruments.

Instrument buyers interested in getting the finest electrical measuring instruments will profit by carrying their inspection beyond the name plate!

After the most critical inspections and tests—after observing Jewell Masters under the most exacting service conditions—important electrical manufacturers, central stations, and railroads have selected Master Instruments for field, production, and laboratory service.

These results are fully justified. Not only do Jewell Master Instruments comprise the most complete line of intermediate size instruments—they are an outstanding achievement in instrument design.

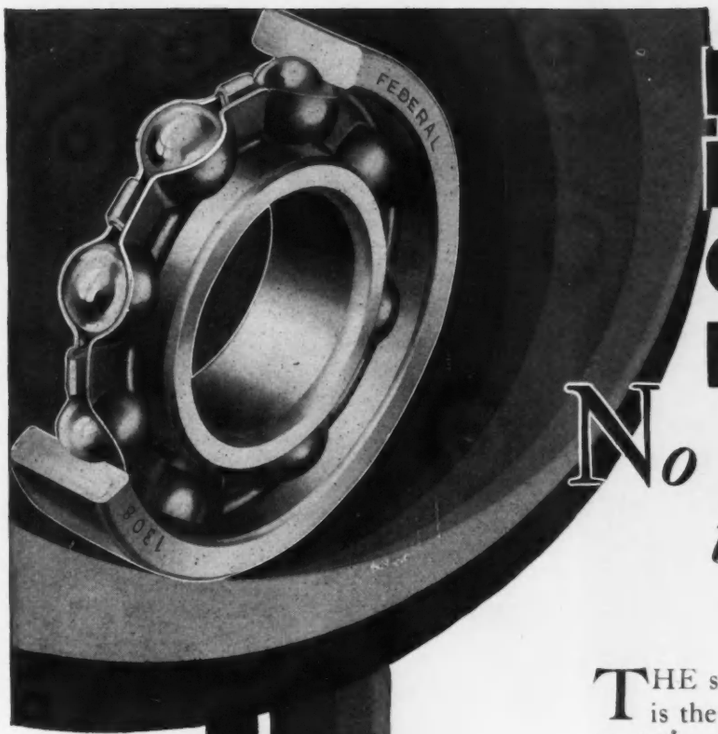
If you are not thoroughly familiar with the Jewell Master Line, you have a very agreeable and interesting surprise in store. Why not call in the nearest Jewell representative and let him show Jewell Masters to you?

JEWELL ELECTRICAL INSTRUMENT COMPANY
1650 Walnut Street, Chicago, Illinois

Manufacturers of a complete line of high grade portable and switchboard instruments. Catalog on request.

30 YEARS MAKING GOOD INSTRUMENTS

JEWELL



BETTER BEARINGS CANNOT BE HAD...

No matter what the price..

THE steel that goes into these bearings is the finest high carbon chrome steel. Each bearing is made with utmost care and precision. Every operation is checked. Every bearing part tested and calibrated. The most minute inspection follows every step in processing. The result is—a bearing of unusual quality giving better service and capable of sustaining the name and reputation of FEDERAL RADIAL BALL BEARINGS.

These are the reasons why we feel justified in making the statement that better bearings cannot be obtained, regardless of price!

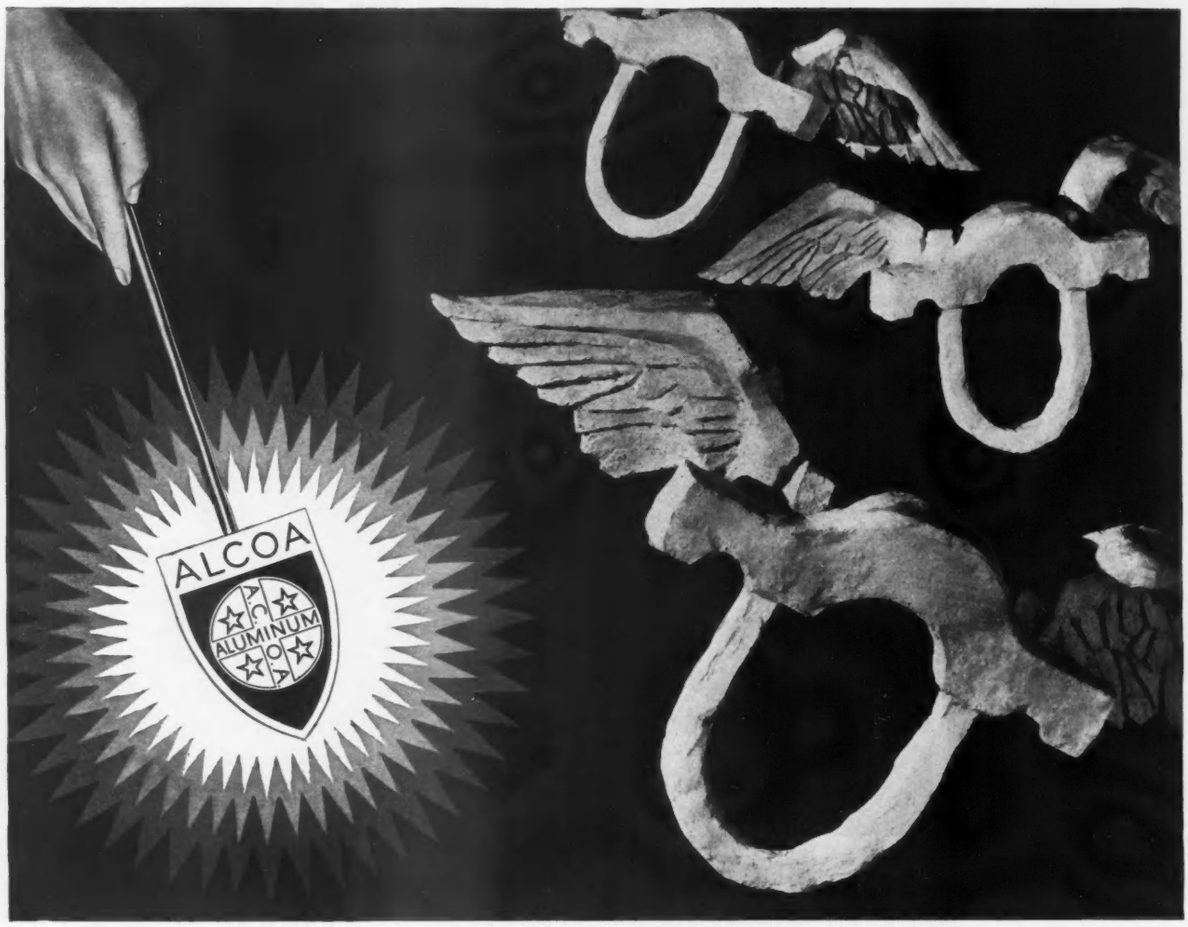
The Mark of a Good Bearing

The Federal Bearings Company, Inc.
Poughkeepsie, N. Y.

Detroit Sales Office: 917 Book Bldg.

FEDERAL

LIGHT TO WOMAN'S TOUCH . . . STRONG TO SERVE



Take off the yoke of dead-weight and women will listen and hasten to buy

Lightness is an argument that carries a lot of weight with women. When you are talking vacuum cleaners Alcoa Aluminum should be stressed; or speaking of waffle-moulds remember the Alcoa Aluminum grid that requires no grease and is an exceptionally good conductor of heat; when it comes to electric washing machines Alcoa Aluminum adds strength to light weight; —and so on to all the table appliances which find Alcoa Aluminum a safe metal for food. Sum up all your other sales facts, then point out the modern metal—Alcoa Aluminum—"Light to Woman's Touch, Strong to Serve". ALUMINUM COMPANY *of* AMERICA; 2444 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

for

HEATING ELEMENTS

Heating Appliance and Apparatus manufacturers are not selecting ELEMITE because it is competitively priced, but for its superior insulating value. ELEMITE is made to insulate the electric heating element; its porcelain-like structure offering a unique flexibility that prevents "break-downs" with sudden temperature changes. It can be formed in the most intricate shapes. It is safe and has long life. Best of all—It Radiates Heat, and does not absorb it. In all, ELEMITE is a Worthy Insulation for Worthy Heating Apparatus.

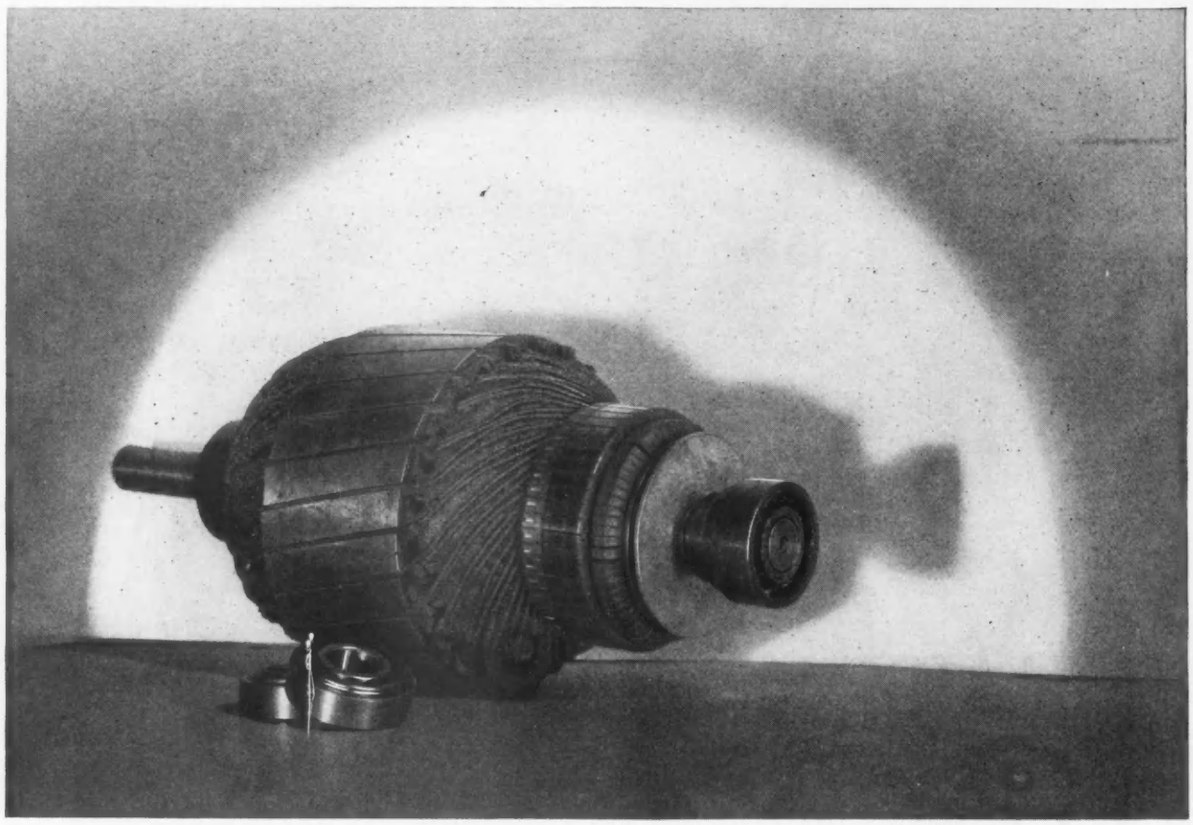
Samples upon request

THE LOUTHAN MANUFACTURING CO.

CERAMIC SPECIALISTS — Elemite — ESTABLISHED —1901—

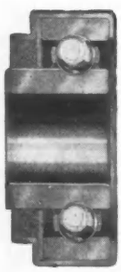
EAST LIVERPOOL - OHIO

NEW DEPARTURE BALL BEARINGS



Two Billion Revolutions—without lubrication attention

New Departure's self-lubricated and self-sealed ball bearing—the N-D-Seal—is setting up new possibilities in economy, cleanliness and carefree operation. ● The armature shown has just completed a predetermined test run of 20,000 hours, mounted on N-D-Seals. Absolutely no attention was given to the bearings during the entire run. No lubricant leaked past the seals and the bearings are still in excellent condition — the motor could have continued for many more thousand hours. ● On the basis of a fifty-hour working week, the approximate equivalent of eight years' performance is represented in this test. ● No other anti-friction development of recent years has so aroused the interest and admiration of engineers in all industries as has the N-D-Seal Ball Bearing. May we send descriptive Booklet N? The New Departure Mfg. Company, General Offices and Main Works, Bristol, Connecticut; Detroit, Chicago and San Francisco.



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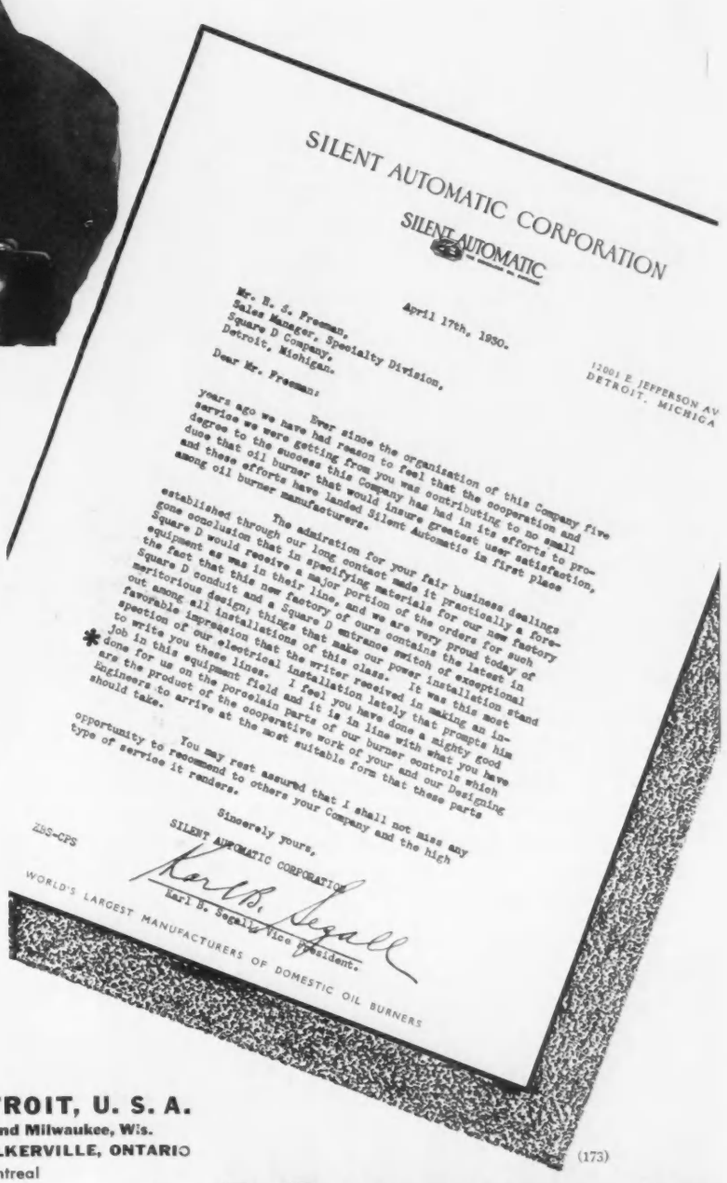
NOTHING ROLLS LIKE A BALL

"Your cooperation helped us to determine the most suitable form for the porcelain parts of our burner controls."

The present compact, efficient form of the control mechanism of the Silent Automatic oil burner unit, shown with and without cover. This was perfected through the cooperation of Silent Automatic and Square D designing engineers.



SILENT AUTOMATIC CORPORATION

SILENT AUTOMATIC

April 17th, 1930.

Mr. B. J. Freeman,
Sales Manager, Specialty Division,
Square D Company,
Detroit, Michigan.

12801 E. JEFFERSON AV
DETROIT, MICHIGA

Dear Mr. Freeman:

Ever since the organization of this Company five years ago we have had reason to feel that the cooperation and service we were getting from you was contributing to no small degree to the success this Company has had in its efforts to produce that oil burner that would insure greatest user satisfaction, and these efforts have landed Silent Automatic in first place among oil burner manufacturers.

The admiration for your fair business dealings established through our long contact made it practically a foregone conclusion that in specifying materials for our new factory Square D would receive a major portion of the orders for such equipment as was in their line, and we are very proud today of the fact that this new factory of ours contains the latest in Square D conduit and a Square D entrance switch of exceptional meritorious design; things that make our power installation stand out among all installations of this class. It was this most favorable impression that the writer received in making an inspection of our electrical installation lately that prompts him to write you these lines. I feel you have done a mighty good job in this equipment field and it is in line with what you have done for us on the porcelain parts of our burner controls which are the product of the cooperative work of your and our Designing Engineers to arrive at the most suitable form that these parts should take.

You may rest assured that I shall not miss any opportunity to recommend to others your Company and the high type of service it renders.

Sincerely yours,

SILENT AUTOMATIC CORPORATION

Karl B. Segall, Vice President.

ZSS-CPS

WORLD'S LARGEST MANUFACTURERS OF DOMESTIC OIL BURNERS

This letter from the world's largest producer of domestic oil burners tells a convincing story of genuine service. But it is just one of *many* stories of valuable assistance rendered to industry, by the Specialty Division of the Square D Company.

With its unlimited facilities, in one of the most complete and modern plants of its kind in the country, this Square D Division produces special electrical fittings which are integral parts of the products of a variety of leading manufacturers. These parts are made *complete* and, in many instances, warehoused and shipped by Square D.

Square D offers the services of its Specialty Division to *your* company. Call on Square D engineers . . . practical men who know electrical specialty problems, from long experience . . . when tough problems confront you.

SQUARE D COMPANY, DETROIT, U. S. A.
Factories at: Detroit, Mich., Peru, Ind., and Milwaukee, Wis.
SQUARE D COMPANY, CANADA, LTD., WALKERVILLE, ONTARIO
Branch Offices: Toronto, Montreal

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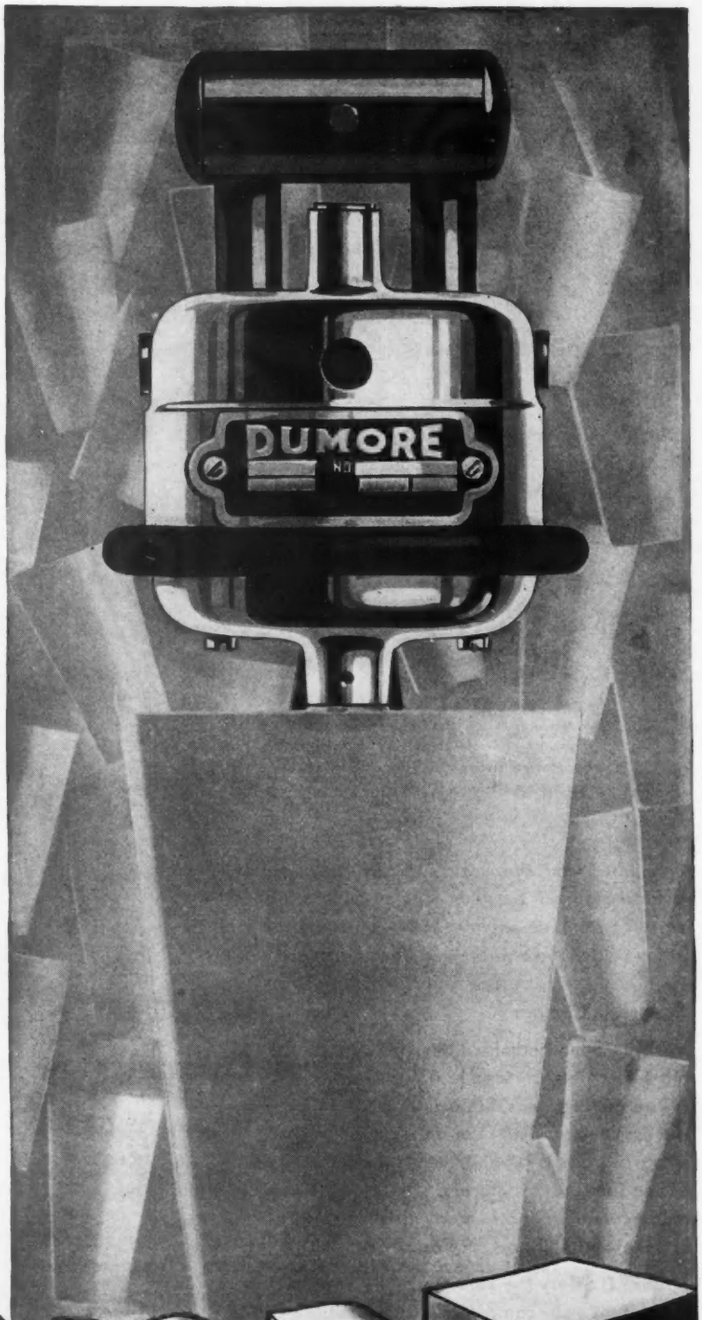
Chicago	Grand Rapids	Minneapolis	San Francisco
Cincinnati	Houston	New York	Seattle
Cleveland	Indianapolis	Philadelphia	Syracuse

SQUARE D

SPECIALTY DIVISION

Making Electric Servants Better



TO the efficiency of drink mixers—and of countless other labor-saving electrical devices—Dumore Fractional Horsepower Universal Motors have contributed an essential part. Their speed, strength, economy and dependability of performance, make possible the preferred position such appliances hold in the home. Manufacturers whose performance problems are particularly exacting and who insist on absolute dependability have used Dumore Motors for many years . . . If you want reliable, trouble-free, vibrationless motor performance, based on scientific design and constructed with typical Dumore craftsmanship, it will pay you to investigate Dumore Motors.

THE DUMORE COMPANY
35 Sixteenth Street Racine, Wisconsin

DUMORE
FRACTIONAL HORSEPOWER
MOTORS

GREATER RETURNS

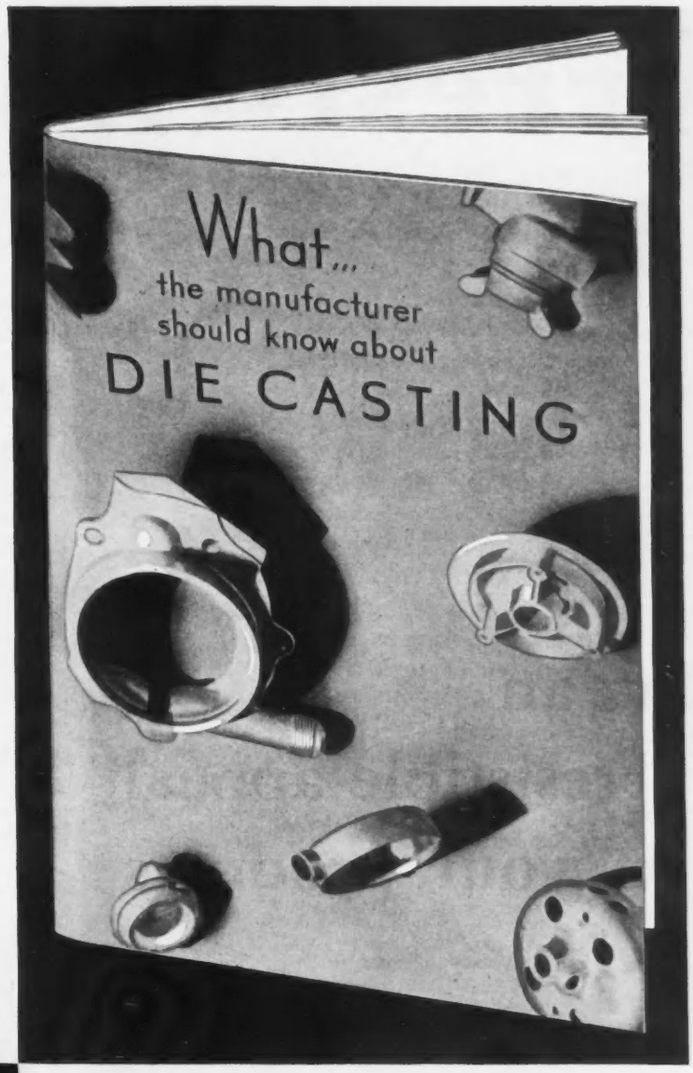
◆

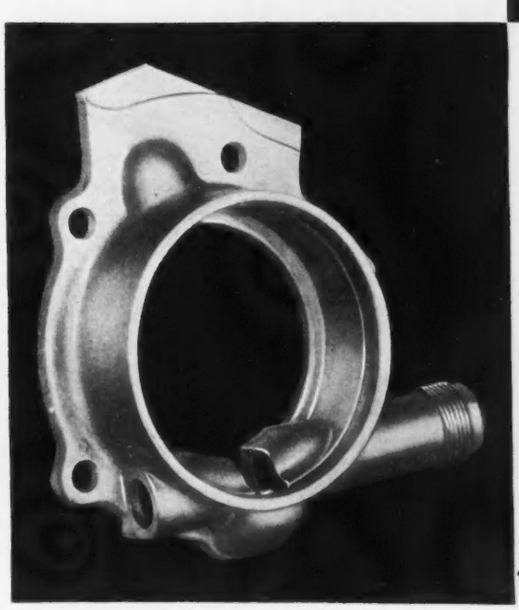
from your Investment IN DIE CASTINGS

THE real cost or actual value of a die cast part is not always immediately apparent. It is usually during the assembling operations that the buyer discovers the value of factors, other than price, which finally determine whether or not his purchase of die castings has been a good investment. Later, when the finished product is put into actual use, the value of these factors is further demonstrated.

To buy die castings intelligently, it is not necessary to have detailed, technical knowledge of the die casting process. It is helpful to know, however, what factors enter into the process and to what extent they determine the price of the finished casting.

A request, on your business stationery, will bring you your copy of this photographically illustrated booklet.





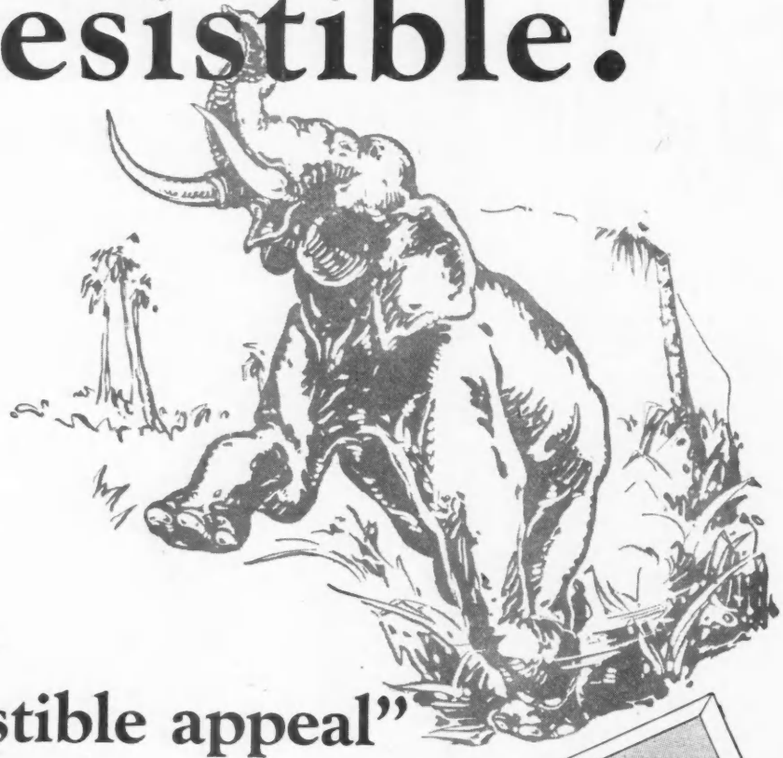
The booklet pictured on this page was written to acquaint the manufacturer who buys die castings with these factors in order that he may be in a better position to judge quotations and proposals . . . to determine in advance which die casting manufacturer is offering him the greatest possible return for his die casting investment.

The die casting pictured at the left is a rear retainer for an automobile transmission shaft, and also serves as a speedometer gear housing. The users had practically given up the idea of die casting this part when Milwaukee Engineers succeeded in producing it to their complete satisfaction.

MILWAUKEE DIE CASTING COMPANY
289 FOURTH STREET MILWAUKEE, WIS.

MILWAUKEE
DIE CASTINGS AND BEARINGS

Irresistible!



Put an
"irresistible appeal"
in your products
with — —

NEWTON
NEW-HAVEN

Die Castings

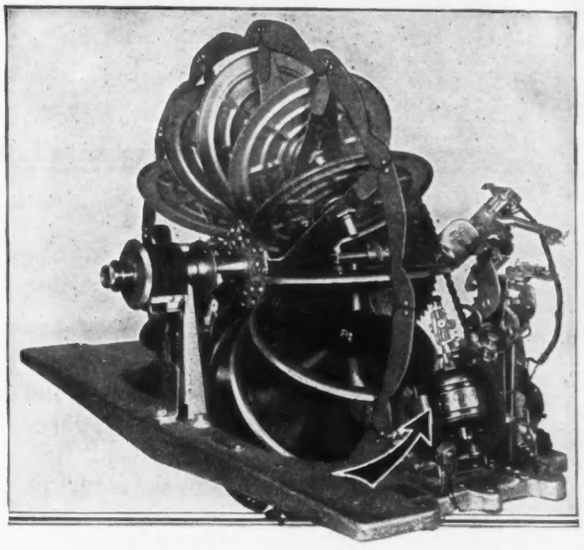
Thousands of the fastest selling articles have gained their popularity through the advantages of die castings. Why not ask us about these advantages for your products?

Lower manufacturing costs, if nothing else, should interest you in Newton Die Castings.

THE NEWTON DIE CASTING CORPN.
146 Munson Street New Haven, Conn.

NDC-28

▲ ▲ ▲ ▲ HOW BODINE MOTORS SERVE MILLS NOVELTY AUTOMATIC PHONOGRAPHS



TO PAY the fiddler, the modern way, you merely slip a coin into a Mills Automatic Phonograph and a dozen different orchestras are awaiting their turn to entertain you.

Twelve records on individual turntables are mounted in a revolving Ferris wheel. When you insert a coin, a Bodine Type CR-3 Universal Motor indexes the desired record in line with the electric pickup. Then another Bodine motor, a Type CA-2 Shaded Pole Single Phase Motor with a special shaft extension comes into action and revolves the record by friction drive at proper speed. Instantly, the electric pickup communicates its vibrations to the dynamic loud speaker and the room is filled with stirring music.

From coast to coast these automatic phonographs perform under all conditions of weather and temperature. Reliability is paramount. Hence, Bodine motors are standard equipment on these instruments. Where unfailing performance is imperative, you will find Bodine motors.

IF YOU USE SMALL MOTORS—

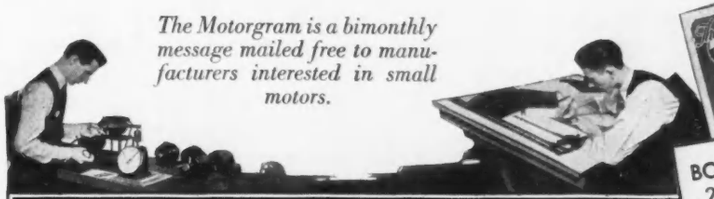
let Bodine engineers test your motor-driven machines and engineer a motor to exactly meet your requirements. You will be surprised at the improved performance and often reduced manufacturing cost of your units if you use a motor that is designed for the job.

Bodine motors are available at all standard speeds in ratings from 1-1300 H.P. to 1-4 H.P. Send for the Bodine catalog. It is a valuable reference book on fractional horsepower motors for designers and engineers.

MAIL THE COUPON FOR BODINE CATALOG

BODINE

Bodine A.C. and D. C. Motors are interchangeable for dimensions and speeds . .



The Motorgram is a bimonthly message mailed free to manufacturers interested in small motors.

BODINE ELECTRIC CO.
.25> W. Ohio Street, Chicago
Please send items checked below:
☐ Bodine Catalog ☐ Motorgram
Name----------
Title----------
Address----------

BODINE MOTORS
ENGINEERED FOR YOUR PRODUCT

BUSY MOTORS

TWENTY-FOUR hours a day, three hundred and sixty-five days a year continuous service is not an unusual record for Ohio Motors. They are purchased not on price, but because of the service they render.

It is possible to build a really fine Motor. Such a Motor is not just good enough, but nothing is left undone to make it the finest Motor that can be built.

In the Ohio plant, for instance, merely checking every fifth or sixth casting, gauging every half-dozen machined parts is not enough. Every casting, every machined part must meet the exact specifications established for that piece. The same careful testing and checking applies to all raw materials and to every manufacturing operation.

It is this guarantee of Quality and Accuracy of Production that makes every Ohio Motor a custom built Motor. That Ohio Motors have earned the reputation of Dependabiliy is not a mere accident, but the result of an ideal "To build the finest Motor that knowledge and skill can produce."

Ohio Motors meet all N.E.M.A. and N.E.L.A. specifications.
1/30 *to* 1 *Horsepower.*

THE OHIO ELECTRIC MFG. CO.
5903 Maurice Avenue
Cleveland, Ohio

Formerly
THE OHIO ELECTRIC & CONTROLLER CO.

OHIO reliable MOTORS

OHIO MOTORS

ECONOMICALLY *die cast by Stewart* . .

Note how the Stewart Process made this vacuum cleaner available to housewives with average pocketbooks

HERE is an example of Stewart die-casting in which a complete housing is produced in two halves, making an assembly that not only improves the quality of cleaner as a household utility, but also reduces its cost.

The Stewart process provides strong, light weight, interchangeable die-cast parts, accurate to the thousandth of an inch, and possessing exclusive detail refinements attained only by Stewart Engineers. Due to their accuracy of detail and perfection of finish, machining, handling and assembling expenditures are almost eliminated. Thus manufacturing operations are simplified and unit costs measurably reduced.

Manufacturers, who believe that their production details are too complicated, are invited to investigate the economic advantages of die-casting. A Stewart Engineer will be glad to call and discuss your requirements with you, or we will submit definite information upon receipt of blue prints or samples of your present production.

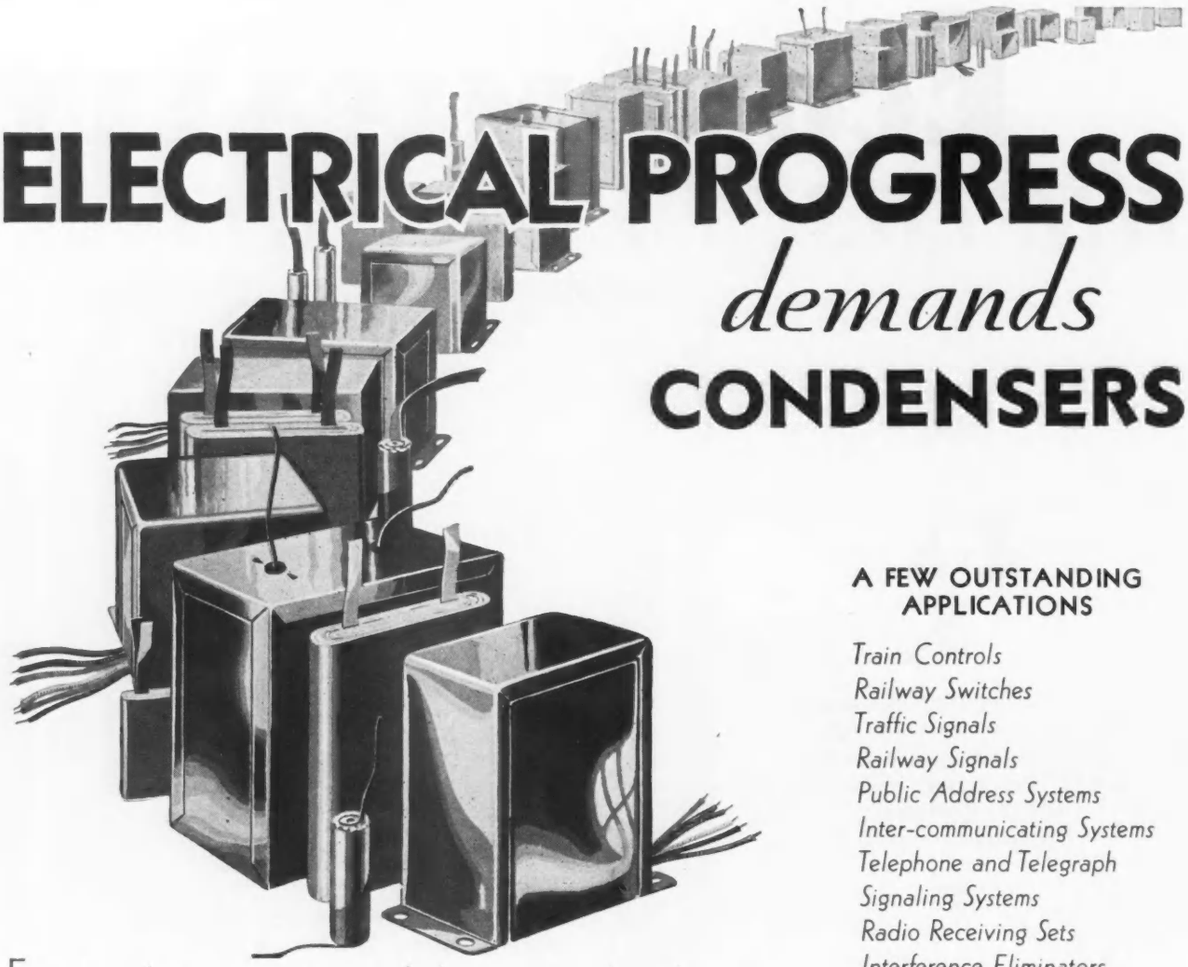
Detroit
Pittsburgh
Dayton
St. Louis
Newark
Cleveland

Stewart

THE STEWART DIE-CASTING CORPORATION
4500 Fullerton Avenue, Chicago, Illinois

Our new "Engineer's Die Casting Handbook" is now ready. It contains a brief, factual description of the die casting process in all of its modern developments. Write for your copy today.

ELECTRICAL PROGRESS *demands* CONDENSERS



For power factor correction, spark absorption, and interference elimination, electrical condensers are indispensable factors in modern electrical engineering. Technically sound in both design and construction, FAST Condensers since 1919 have been the choice of the country's finest radio products. Specialized equipment and volume production make possible economies you should profit by, and FAST quality offers the dependability your product needs.

All the engineering experience of the Fast organization is at your command, and your inquiries are invited for fixed condensers of any capacity or voltage rating.

A FEW OUTSTANDING APPLICATIONS

Train Controls
Railway Switches
Traffic Signals
Railway Signals
Public Address Systems
Inter-communicating Systems
Telephone and Telegraph
Signaling Systems
Radio Receiving Sets
Interference Eliminators
Electric Motors
Motor Equipment
Rectifiers
Engine Ignition
Sign Flashers
Controllers
Lightning Arresters
Automatic Switches
Relay Switches
Electrotherapy
Incubators
Measuring Instruments

FAST

Specialists in Radio Condensers

JOHN E. FAST & CO., 3123 N. Crawford Avenue, CHICAGO, ILL.

National Leaders Choose Baldors!

THE above cross section of Baldor customers include many of the outstanding industries in America. Their use of Baldor Motors, which covers 17 basically different applications, range from Unit Heaters here, to Mining Machinery in Russia.

Many of the firms have been using Baldor Motors from 2 to 10 years. The experience of some of them has covered from 15,000 to 30,000 Baldor Motors.

Specializing from the first in ball bearing design which eliminates thrust and lubrication problems, Baldor has perfected its line to a point that only long experience could produce.

Baldor has added another feature of special advantage for makers of motor driven equipment — matched frame motors, in which the whole assembly is identical for all motors of a given rating and speed.

Ask for folder. Baldor Electric Co., 4352D. Duncan Av., St. Louis, Mo. U.S.A

BALDOR

A BETTER BALL BEARING MOTOR

Eliminates Thrust and Lubrication Problems

The latest edition of this booklet contains important data on the physical properties and corrosion-resistance of Everdur.

REG. U. S. EVERDUR PAT. OFF.

Combines Strength of Steel with high corrosion resistance and easy weldability

Everdur Metal, an exclusive Anaconda Alloy, contains 96% Copper, 3% Silicon and 1% Manganese. It is as strong as low and medium carbon steels, non-magnetic, immune to rust and unusually resistant to corrosion. It welds readily by the usual methods.

Because of these properties, manufacturers of electrical products are using Everdur with excellent results. Wherever a rustless metal of high tensile strength and high fatigue limit is required, Everdur serves to good advantage. Its weldability often solves production problems where both non-corrosive metal and welded construction are desired.

Everdur is manufactured by The American Brass Company in the form of rods, plates, sheets, wire, tubes, hot-pressed parts, forging blanks and casting ingots.

Full information contained in Anaconda Publication E-2, which will be sent upon request.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Connecticut
Offices and Agencies in Principal Cities

ANACONDA
COPPER ANACONDA BRASS

NEON has revolutionized electric display

. . . and DUREZ has helped!

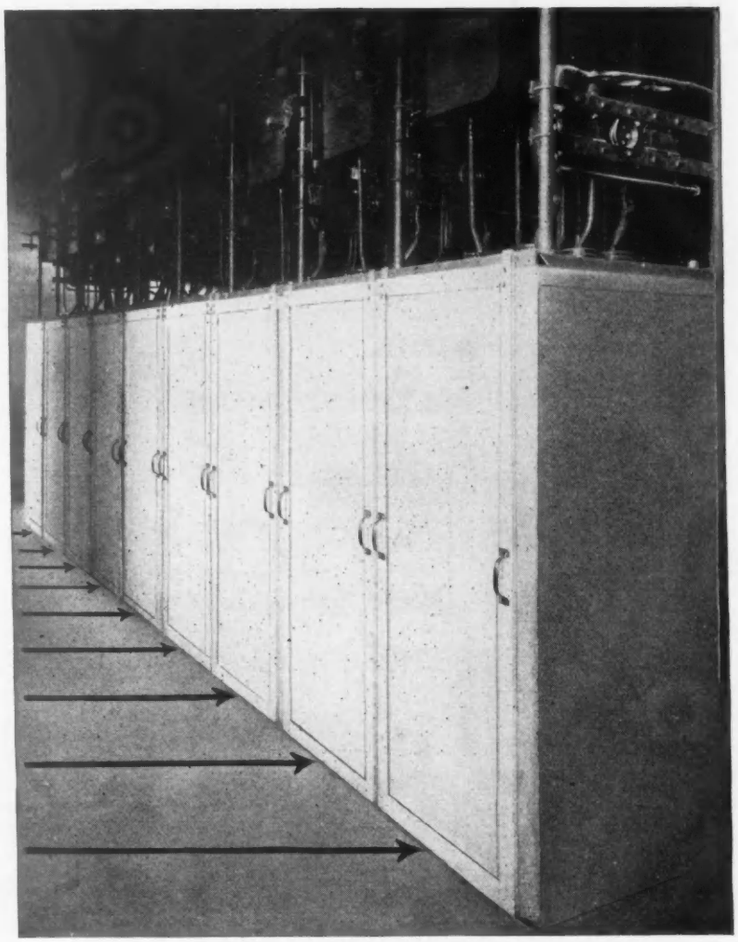
Write for this free booklet, "Do It With Durez." Contains complete information about Durez . . . physical and dielectric properties, color ranges, and scores of possible applications.

YOU see them everywhere, these bright red, gleaming Neon signs. Arresting. Easily read. Modern in design. They've taken electric advertising out of the eye-blinking class . . . and established another use for Durez! For frames on the remarkable Crystalline display, made by the Electrical Products Corporation, Oakland, California, the Associated Claude Neon Companies have selected the perfect molding compound!

Their choice reflects the marvelous adaptability of Durez to all types of modern display. Durez is light—as every sign should be. Durez is beautiful wherever used—coming in all practical colors and combinations of colors. Durez resists blustering winds and snows, blazing sun—all kinds of weather. In fact, for almost any display purpose, inside or outside, window or counter, from street signs to peanut stand bases, Durez is ideal.

And Durez is hard, tough, strong. Virtually never splits or cracks. And whether you make ten, a hundred, a million parts, each will be exactly like the others. . . . Production is economical. Durez goes into the mold. The parts come out of the mold—*finished!* Studs and prongs imbedded. Lettering perfect. Polishing, burnishing, tooling unnecessary. No wonder Durez is rapidly taking the place of wood, metal, porcelain, hard rubber, glass and other materials!

Is your present material the best for your purpose? Does it have the display value, the beauty, the durability and economy Durez offers? Let us tell you more about this molding compound. General Plastics, Inc., 89 E. Walck Road, North Tonawanda, N. Y. Also New York, Chicago, Los Angeles, San Francisco.



AMBLER ASBESTOS LUMBER

is excellent for cell compartment doors

Ambler Asbestos Lumber cannot burn. It has good structural strength—more than is required for any cell or barrier construction. It is readily workable—for doors such as the above it is cut and drilled to specifications at the factory and requires little working at the point of installation.

For assured safety wherever arcs occur or there is a possibility of fire—for shields or barriers, for complete compartments for light apparatus or doors for cement cells for heavy apparatus—there is no better or more economical material than Ambler Asbestos Lumber. Our Engineering Department is ready to consult with you.

AMBLER ASBESTOS PRODUCTS

Fireproof Ambler Asbestos Shingles

Ambler Ebonized Asbestos, special sheet material of high dielectric and physical strength, for electrical uses.

Ambler Asbestos Lumber, for barriers, cell compartments, ovens, fume hoods, etc.

Ambler Linabestos, for interior or exterior sheathing.

Ambler Asbestos Waltile, decorative wainscoting material finished in colors.

Ambler Asbestos Corrugated Roofing and Siding.

Ambler Asbestos Shingle & Sheathing Co.

Ambler, Pa. St. Louis, Mo.

It's seamless and bias cut at the price of Sewn bias

SMALL wonder, that this new Empire seamless bias cloth has gained such immediate popularity! No sewn seams to be cut out —to waste material and time. And it costs no more than sewn bias cloth yet possesses greater dielectric and mechanical strength.

Through the development of a special base cloth, this new electrical insulation has been produced. It's ideal for wrapping joints, coils and similar needs. You can obtain it in black or yellow finish, in tape form or in rolls approximately 36″ wide. *Send for samples!*

MICA INSULATOR COMPANY

New York: 200 Varick Street Chicago: 542 So. Dearborn Street

Cleveland Pittsburgh Cincinnati Birmingham Seattle San Francisco
Los Angeles Toronto Montreal *Works:* Schenectady, N. Y. London, England

PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF

MICA INSULATION OILED CLOTH INSULATION

ILLUMINATING!

Fixtures finished with Egyptian Lacquers are "illuminating" in *two* ways:

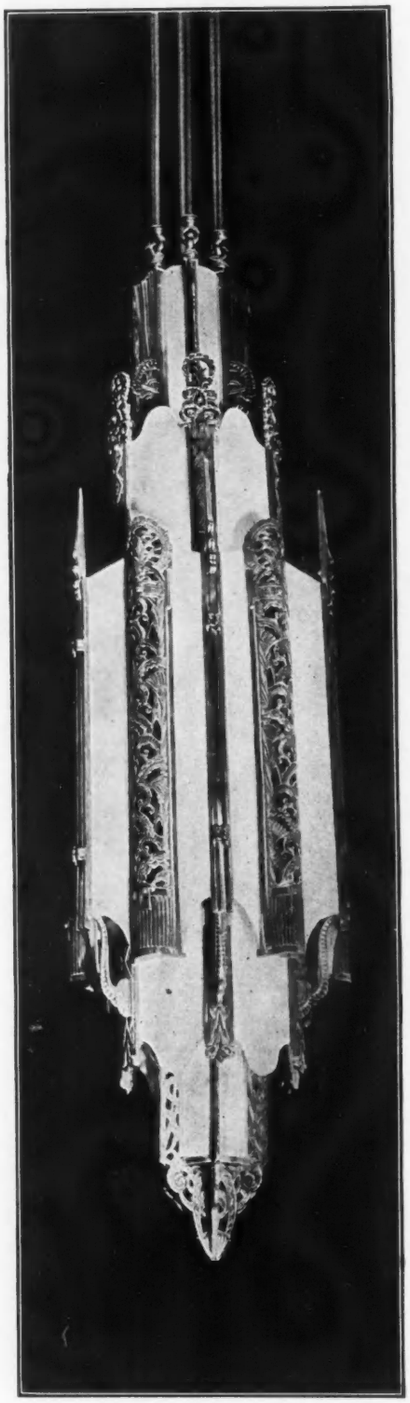
First, they light up places beautifully.

Second, they throw a lot of light on *your* finishing problems. They demonstrate the strict economy of using the *best* materials.

Egyptian can serve *you*—with a special finish for *every* job, if necessary.

★ ★ ★

400-lb. fixture for the new Chanin Building, opposite Grand Central Station, New York City, furnished by the Lightolier Co. Finished in Egyptian Lacquers.



EGYPTIAN Lacquers

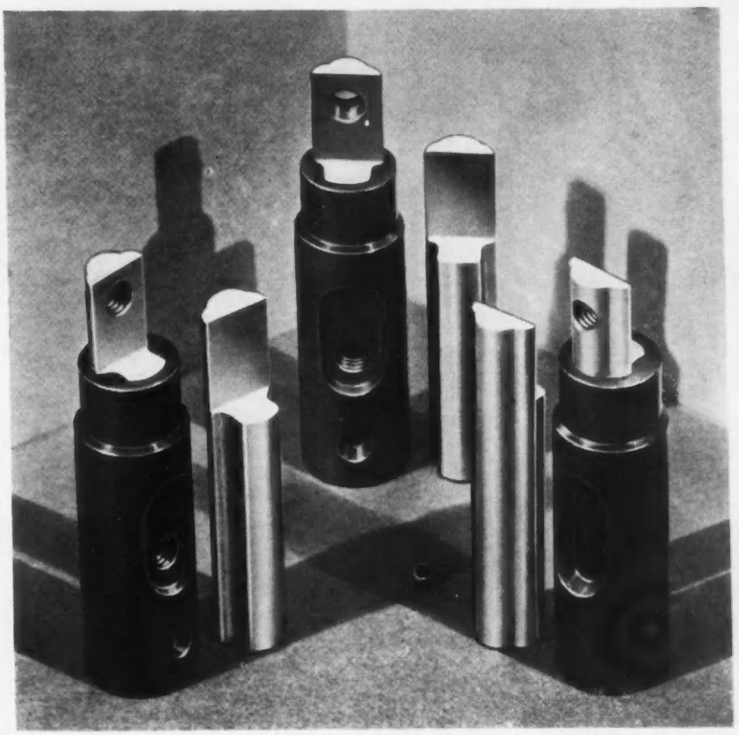
EGYPTIAN SUPERIOR LACQUERS

THE EGYPTIAN LACQUER MFG. CO., 90 WEST ST., NEW YORK CITY

Branches in charge of practical men *maintained in*

ATLANTA BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DALLAS DETROIT KANSAS CITY LOS ANGELES PHILADELPHIA PORTLAND, ORE. SAN FRANCISCO SEATTLE SPOKANE ST. LOUIS

The Maker Who is Proud of What He Makes Uses Egyptian Lacquer



Metal Binding Posts, before and after insulating with Bakelite Molded, made by the Sangamo Electric Co., Springfield, Ill.

IN ONE OPERATION 24 BINDING POSTS RECEIVE PERFECT SHELLS OF BAKELITE MOLDED

The particular suitability of Bakelite Materials to quantity production of electrical parts is clearly illustrated by the molding operation shown here.

At a single closing of the press insulating shells of Bakelite Molded are formed around twenty-four metal binding posts. In the molding operation all necessary cavities and holes are accurately formed and located, and a smooth, lustrous finish is acquired. No subsequent machining or buffing is necessary.

Scores of electrical manufacturers have found Bakelite Molded a means of saving time, reducing costs and insuring uniformity in large production. Because it is high in dielectric strength, mechanically strong, non-hygroscopic, and possesses many other desirable properties, it is used for an ever-widening variety of electrical equipment parts.

Bakelite Engineering Service—We manufacture a wide variety of Bakelite resinoid molding materials, varnishes, lacquers, enamels, cements, and other products. Twenty years experience in the development of these materials for electrical and other uses, provides a valuable background for the cooperation offered by our engineers and laboratories. Write for Booklet 52M, "Bakelite Molded".

BAKELITE CORPORATION, 247 Park Avenue, New York. CHICAGO OFFICE, 635 West Twenty-second Street

BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario

BAKELITE

REGISTERED U. S. PAT. OFF.

"The registered Trade Mark and Symbol above may be used only on products made from materials manufactured by Bakelite Corporation. Under the copyright "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products."

THE MATERIAL OF A THOUSAND USES

THOMAS Special Porcelains in your picture?

Thomas maintains a complete "Special Porcelain" Department where the most exacting needs of the electrical manufacturer may be served, including design, research and production. Special porcelain parts of any size and the most complicated design can be produced in any quantities to meet your manufacturing schedule. Thomas Porcelains are produced in Thomas-made dies and are uniformly true in every respect. Price estimates promptly furnished upon receipt of sketch or model.

SINCE 1873, Thomas Porcelain has played an important part in Electricity's march of progress. Many house and industrial wiring systems are built around it; lighting fixtures, apparatus, and appliances include it. Thousands of tons of Thomas special porcelain parts are in service today. Why not put Thomas Porcelains into your assembled product?

THE R. THOMAS & SONS CO.
LISBON, OHIO, U. S. A.

NEW YORK BOSTON CHICAGO

A Spaulding Engineer helped this Manufacturer Get Better Results..

Let a Spaulding Engineer Work with You in the Selection and Economical Use of Materials

THE maker of this blueprint machine had been using a metal part insulated with mica washers. It worked fairly satisfactorily.. but the fragile mica parts had to be handled with such extreme care that the time and cost of assembling was unreasonably high.

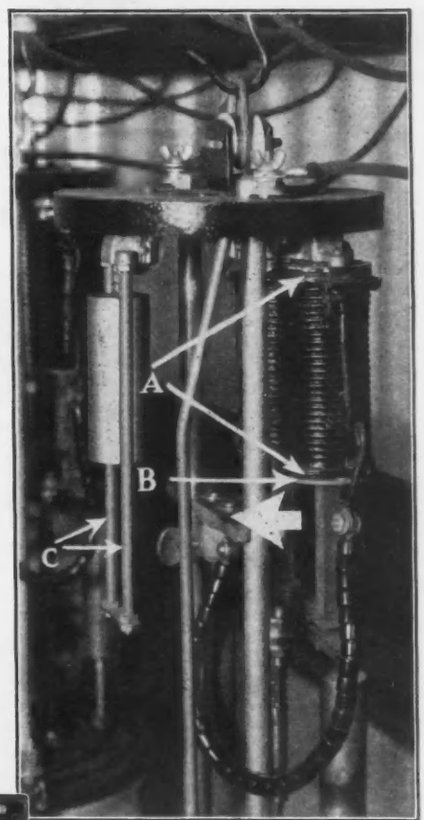
He called in a Spaulding Engineer. Together they devised a single part of Spaulding-Bakelite which immediately supplanted the original metal and mica assembly altogether. The cost dropped, but more than that, the user of the machine was permanently insured against insulating trouble at that important point.

This is but a single example among hundreds where a Spaulding Engineer has evolved a way to replace metal, wood, rubber, porcelain, glass and other materials, with a consequent improvement in the product or part on which they were used—and with a lowered cost of manufacturing.

The high insulating qualities, exceptional strength and durability of Spaulding Fibre, Spaulding-Bakelite and Spaulding Armite equip them perfectly to displace other less efficient and less serviceable materials in the manufacture of both mechanical and electrical products or parts.

The easiest way to determine whether they can be used in your production is to call in a Spaulding Engineer. He will make a careful, conscientious study of your product and all materials used in making it. If the use of any Spaulding material can contribute to durability, efficiency or economy, he will tell you so, and show you how and why.

The process is simple—just ask to have a Spaulding Engineer call, and name the day.



Large arrow points to part now made of Spaulding-Bakelite. Small arrows indicate other parts for which Spaulding Fibre is used, including [a] spool heads, [b] coil shelf underneath coils, and [c] fibre tube insulators on guide rods.

SPAULDING FIBRE COMPANY, INC.
TONAWANDA, NEW YORK

New York, N. Y. Chicago, Ill. Boston, Mass. Cleveland, Ohio Milwaukee, Wis.
Philadelphia, Pa. Cincinnati, Ohio Los Angeles, Cal. Detroit, Mich.
St. Louis, Mo. San Francisco, Cal.

A Spaulding Engineer helped to make this machine less expensive to build, and more trouble-free in service through the substitution of a Spaulding-Bakelite part for the one formerly made of metal and mica shown in the insert.

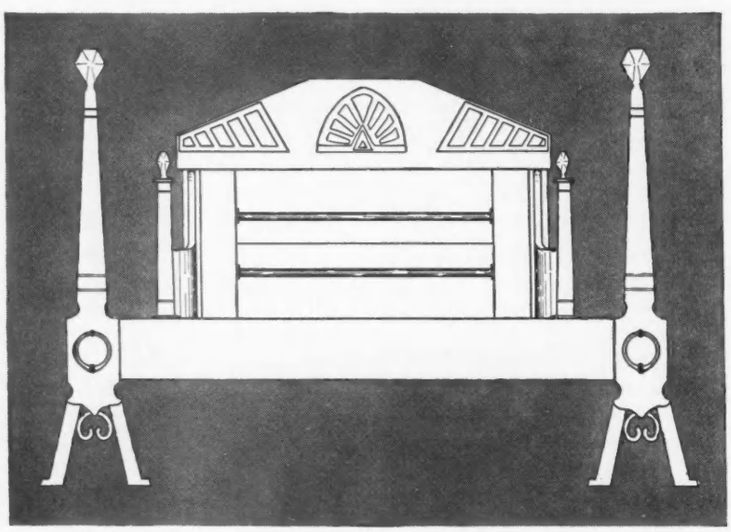
Spaulding

FIBRE (GENUINE HARD VULCANIZED)
BAKELITE (LAMINATED)
ARMITE (THE IDEAL THIN INSULATION)

AGAIN Globar BRAND ELECTRIC HEATING ELEMENTS

REG. U.S. PAT. OFF.

are called upon to solve a manufacturer's problem



THE manufacturer wanted to convert a fireplace unit from gas to electricity, still maintaining its pleasing design, making certain an added heating efficiency—keeping manufacturing costs in line with the old unit.

Globar engineers redesigned the device—equipped it with Globar Brand Electric Heating Elements—and the problem was solved.

The result, as the sketch indicates, was a design of pleasing appearance—but what the sketch doesn't show is its remarkable heating efficiency and low cost of production.

The unit will operate on 110 or 120-volt circuits—2000 or 3000-watt capacity with a three-heat control.

THIS is just one of many services Globar engineers are rendering the manufacturer of electrical heating devices. We would welcome a chance to sit in with your organization on similar problems

GLOBAR CORPORATION, NIAGARA FALLS, N. Y.

(A SUBSIDIARY OF THE CARBORUNDUM COMPANY)

Pacific Abrasive Supply Co., San Francisco and Los Angeles

Williams & Wilson, Ltd., Montreal—Toronto, Canada

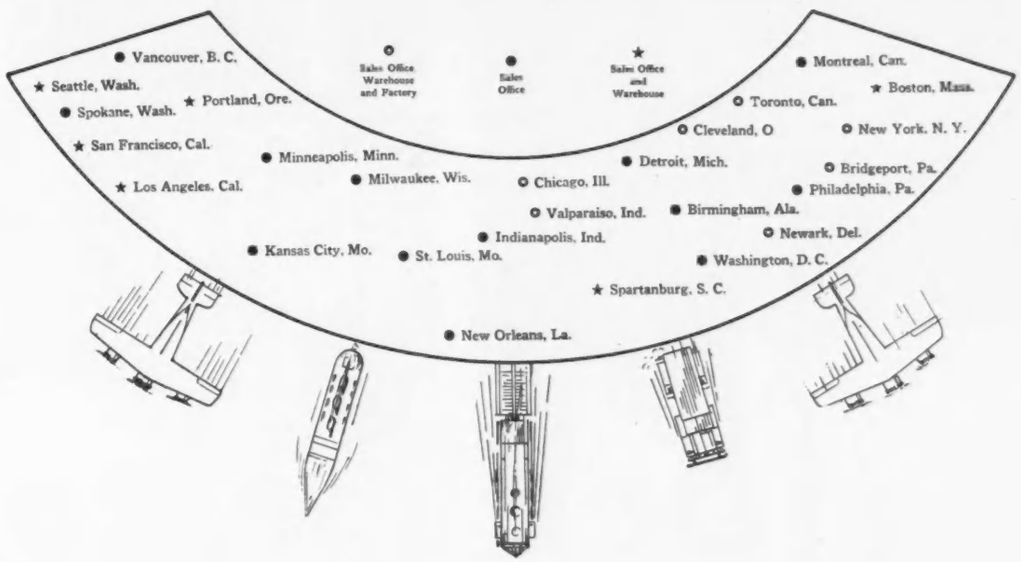
Steinmetz & Company, Philadelphia

(Globar is the registered trade name given to non-metallic electrical heating and resistance materials, and to other products of Globar Corporation, and is its exclusive property.)

13 units

ready to rush your order for

DILECTO, DIAMOND FIBRE, MICABOND



Dilecto is an exceptionally uniform and high quality laminated phenolic insulating material. The combination of the following outstanding qualities has set Dilecto distinctly apart from other insulating materials — high dielectric strength; great physical strength; an imperviousness to oil, water and chemicals; accurate, easy machinability; and permanence.

Diamond Fibre is a hard vulcanized fibre offering a high quality insulating material of unusual toughness, with great resistance to abrasion, crushing and shocks. Diamond Fibre is oil proof, highly resistant to chemicals and is unaffected by age. It can be machined in any way that metal can be machined, and can also be bent or formed as desired.

Micabond is an exceptionally high quality mica insulating material made in sheets and tubes. It is unaffected by extreme temperatures, is mechanically strong and can be punched or machined to specification. Micabond segments and commutator rings are stocked in many standard sizes and shapes or can be supplied to your specifications.

Stocks of sheets, rods and tubes—equipment for machining them to your specifications—men trained to interpret your requirements; this is the type of service we offer you from our main factories and service branches.

Make our service branch your stock room and machine department. Let our engineers work with yours in designing mechanical and electrical insulating parts more economically and for greater efficiency.

Every service you will ever need to facilitate the handling of your inquiries and orders for Dilecto, Diamond Fibre and Micabond, is available from our service branches without obligation or extra cost. Make full use of it!

CONTINENTAL-DIAMOND FIBRE COMPANY

Manufacturers of Dilecto—Diamond Fibre—Celoron

NEWARK, DELAWARE

BOSTON, MASS.
NEW YORK, N. Y.
CLEVELAND, O.
CHICAGO, ILL.
SAN FRANCISCO, CAL.
TORONTO, CAN.
KANSAS CITY, MO.

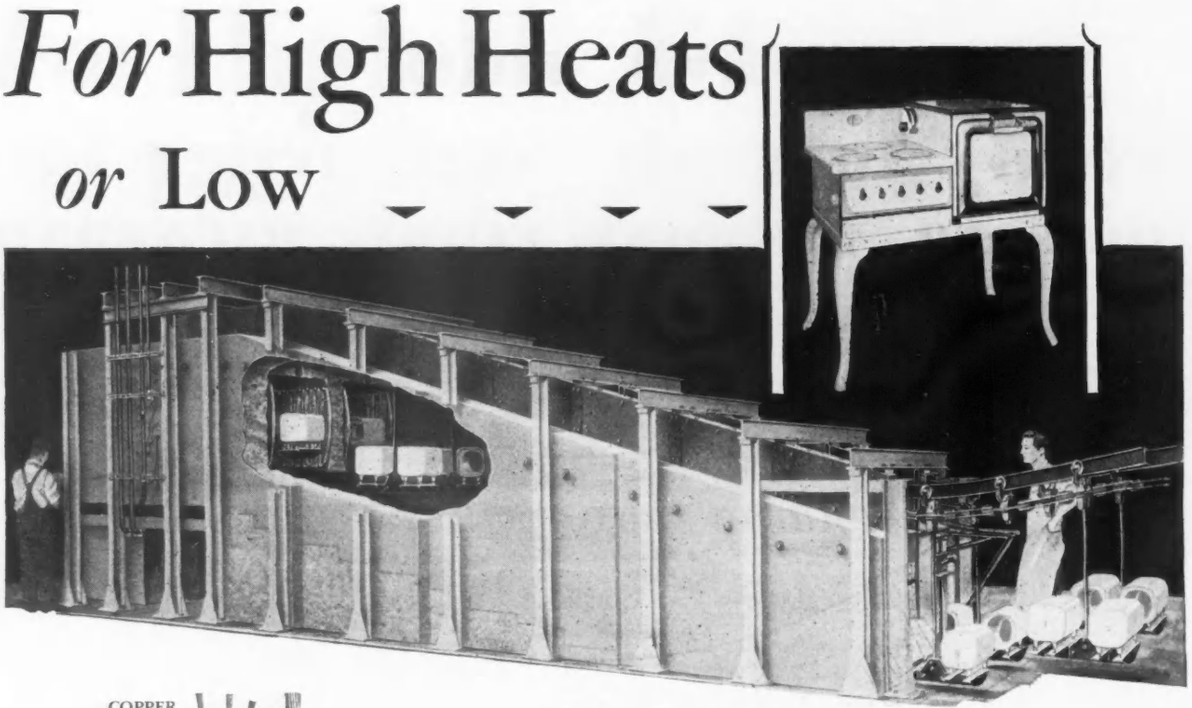
MILWAUKEE, WIS.
SPARTANBURG, S. C.
PHILADELPHIA, PA.
ST. LOUIS, MO.
WASHINGTON, D. C.

DETROIT, MICH.
NEW ORLEANS, LA.
INDIANAPOLIS, IND.
MINNEAPOLIS, MINN.
BIRMINGHAM, ALA.

SPOKANE, WASH.
VANCOUVER, B. C., CAN.
MONTREAL, CAN.
LOS ANGELES, CAL.
SEATTLE, WASH.
PORTLAND, ORE.
BRIDGEPORT, PA.
VALPARAISO, IND.

In Canada
DIAMOND STATE FIBRE CO. OF CANADA, LTD.
350 Eastern Avenue, Toronto

For High Heats *or* Low



Baking Enamel on Electric Refrigeration Units

Deltabeston

(ASBESTOS INSULATED)

Stove Wire *and* Range Cable

LONG-FIBER
Asbestos
for Deltabeston

Magnet Wire
Station Cable
Switchboard Wire
Motor Leads
Headlight Wire
Cab Cord
Stove Wire
Fixture Wire
Control Cable

FEARFUL heats in industry . . . milder heats in the home—Deltabeston Stove Wire and Cable endure them all unfailingly, for years and years.

These wires withstand the moisture, overloads, abuse so often inescapable. That's why leading range manufacturers specify them for every use.

Long-fiber pure asbestos is *felted* compactly onto copper, monel or nickel conductors . . . saturated in flame-proof compound . . . jacketed in a tough asbestos braid. Not a thread of cotton or anything else that can ever carbonize. Rugged but flexible. That's Deltabeston!

Delivery is prompt everywhere. Write Section Y-328, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

DELTABESTON WIRE

GENERAL ELECTRIC

DELTABESTON WIRE

MERCHANDISE DEPARTMENT • GENERAL ELECTRIC COMPANY • BRIDGEPORT, CONNECTICUT

SEP 10 1930

Electrical Manufacturing

Production - Marketing - Administration - Repairing

Volume 6 AUGUST-1930 Number 2

How to Keep Overhead Expense

in Balance

with Reduced Production

WHEN considering labor costs it is customary to berate roundly the wearers of overalls, to give scant thought to the white-collar workers, and to utterly ignore the exalted executive talent whose badge is ofttimes the high hat.

Yet the final cost of a product must of necessity contain the wages or salaries of all three groups. The well-managed company is the one which gets value received for all of the wages it pays—whether those wages go to president or office boy, skilled mechanic or trucker, salesmanager or salesman, clerk or department head, foreman or stockkeeper.

Failure to insist on getting value received from everyone on the payroll accounts for most of the waste in industry, estimated at various amounts, but usually in sums ranging in the billions of dollars a year. At least half of this waste is caused by faulty management—ignorance of the best methods now in use, a wrong approach to the problem, too implicit reliance on systems of one sort or another, incompetence of the executive personnel or sheer carelessness and shiftlessness.

I believe that calling the early efforts at cost reduction, "scientific management" was unfortunate, for it gave many people the idea that management could be made an *exact* science—which it emphatically cannot. Scientific methods can to a degree be applied in industry, but so long as men are involved, management cannot be made an exact science.

While it may be possible to develop by scientific methods a Robot made of gears and cams

By CHARLES H. HATCH

Vice-President, Miller, Franklin & Co., Inc.

and levers which can displace men in certain activities, it is, theorists to the contrary, definitely impossible to mechanize the human being, for the human being is the most variable factor in industry. Divide and subdivide operations as much as you will, even to the point where a single simple movement of the hand or foot is all that is necessary and there still remain uncontrollable and unpredictable variations in speed, accuracy and endurance over which no scientific control is possible. A poor night's sleep, too much corned beef and cabbage or a slight marital disagreement knocks the scientific control into a cocked hat. That goes for executive, clerk or workman.

"Failure to insist on getting value received from everyone on the payroll accounts for most of the waste in industry. Much of the waste is caused by too implicit reliance on systems of one sort or another and incompetence of the executive personnel or sheer carelessness and shiftlessness"

Not that science has no place in dealing with labor. For instance, scientific time-study is a valuable aid in determining how an operation should be performed, but as an exact measure on which to set standards of production it is lacking.

No matter how exactly the theoretical time of an operation is set, there are many variables which enter. In addition to those which depend upon the operator's temporary physical or mental state, there is a tremendous variable in the allowance for fatigue and personal needs. In spite of some attempts at setting them scientifically, these allowances are actually little more than educated guesses. To base standards of production on highly accurate time-studies tempered by guessed-at allowances is much like expecting to get the area of a circle with accuracy by guessing at the diameter and then multiplying by pi carried to fifteen decimal places.

It is high time we definitely learned that management cannot be an exact science. Much time and money has been wasted trying to devise scientific methods which would take away all need for common sense and constant alertness on the part of executives.

I have been an industrial engineer for a good many years, and in that time I have seen many systems developed which their sponsors hoped, and often believed, would make the running of a business all but automatic.

SOME enthusiasts hailed the cost system as a sort of automatic super-manager which would relieve executives of all further troubles in their pursuit of profits. Some companies went to the dogs because their executives relied on the non-existent managerial ability of a really excellent cost system.

Others pinned their faith upon production-planning systems of one sort or another which they were assured would automatically regulate the flow of goods through the plant at high speed and low cost. Many of these systems had the ear-marks of scientific devices. Had the workers been strictly mechanical, all might have been as prophesied.

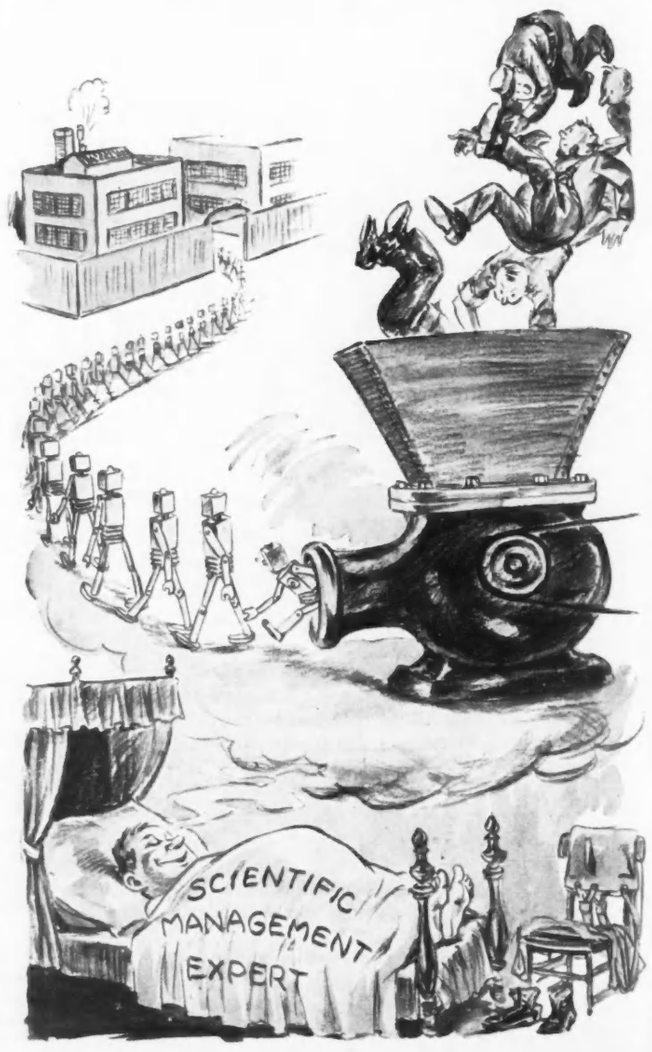
What I have said about factory workers applies at least to an equal extent to clerks and executives. You can give clerks billing and tabulating machines, and you can give executives their charts, reports and systems, but you cannot make an exact science of their work nor be sure they are getting proper results unless you apply common sense and exert constant supervision to make certain that everyone who is on the payroll returns full value for what he gets.

As a matter of fact, the greatest possibilities of savings today are in the expenditures for white-collar and executive work. The waste there is tremendous—and all but ignored.

Fifteen years or so ago a fairly competent engineer, equipped with a knowledge of the elements of production technique, could walk into nearly any plant and with no great study reduce the cost of direct labor as much as 35 per cent. It was not rare for production to be doubled with half the men. I know of one instance where the production of four plants was concentrated in one, and the number of workmen in that plant reduced from 250 to 125.

Again, a quite casual observation of the operation of a certain large machine showed that the nineteen men employed to serve it spent nearly half of their time idle. It took no gigantic intellect to see that the trouble was inherent in the machine. By a simple readjustment of a gear, which resulted in staggering the movement of certain parts, it was possible to keep the men busy almost constantly, with the result that eleven men now tend the machine that formerly required nineteen.

I could cite dozens of instances to show how easy it often was to eliminate large quantities of labor from factories. The wastes in productive labor were not only enormous—



"SCIENTIFIC Management" is an unfortunate term, for it gives many people the idea that management can be made an exact science—which it emphatically cannot. . . . It is definitely impossible to mechanize the human being, for he is the most variable factor in industry

indeed they were glaring.

Today it is not so easy to make betterments in the use of direct labor. It is hard work for an experienced and highly capable production man to reduce direct labor costs as much as 7 per cent in the majority of factories. That is not necessarily a tribute to the ability of the run of manufacturers. It is rather due to the fact that those who permitted a greater waste of productive labor to continue have gone out of business or been gobbled up by their more efficient competitors who saw the opportunity to cure the sick ones. Many a merger has had its inception in just that.

The first efforts to increase production per man had one thing in common—they all exerted pressure upon the workers from without. Today it is coming to be seen that the common sense way is to get the workman to give willing cooperation—to stimulate production from within rather than to force it from without. Incorrigible optimists have tried to secure this effect by coddling labor in one way or another—in rare instances with a certain measure of success. However, there is increasing skepticism as to the real effectiveness of most forms of welfare work and employee representation plans in stimulating the productivity of workmen.

More recently there has been a much sounder development—the group bonus plan of wage payment, by which it was hoped to give factory employees much of the interest in producing that they would have were they in business for themselves.

In effect, the workmen under these plans are paid a base rate of some sort plus a bonus for keeping the cost of production below a definite standard. The aim is not merely to increase the efforts of each productive worker, but to stimulate so-called non-productive workers to lend a hand when they have none of their regular work to do. Also, it is expected, since the earnings of the individuals depend upon the ability of the group to keep labor costs down, that they will take the initiative in reducing the number of working hours of their group immediately the amount of work to be done shows any very appreciable signs of falling off.

On the face of it such a plan seems simple and effective, but the fact is that most of them have had serious faults. For one thing, under the usual group bonus plan, it is usually necessary to set up special production lines and even special departments to care for special conditions that arise. Work not in the regular production lines is inevitably slowed up. Besides, with most group bonus systems it is necessary to retain nearly all of the clerical work that is required under the straight day wage or the various forms of wage incentive.

This is not the place to discuss in detail the reasons for the success or failure of the various group bonus plans. Suffice it that there are ways by which this fundamentally sound method of leading the workmen to exert pressure from within for lower production costs can be set up so that there are no serious weaknesses.

ONE group, or, as I prefer to call it, as more accurate, "departmental labor saving" bonus plan, which has worked out entirely successfully, has as its basic consideration that while the plan places no theoretical limit on what a worker can earn per hour, there is a definite limit to what a unit of production can cost the employer.

In one plant where this method is in use the total factory payroll has been reduced more than 12 per cent, while the earnings of the employees have increased from 8 per cent to 27 per cent. It is to be noted that this reduction is in total payroll. It is not merely a reduction in so-called "productive" labor cost. A certain part of it is due to reduction in indirect labor, including clerical. In fact, the clerical work for payroll purposes in one department alone formerly required full time of five clerks. It is now handled on half time of one clerk.

The indirect or so-called "non-productive" factory labor can in most instances be greatly reduced by the application of the kind of common sense that tests all activities by the question, "Does it pay?" Lack of that common sense sometimes results in increases of the indirect labor cost.

When a theorist breaks loose without restraint he can do strange things. Thus, in one instance, a conveyor was installed to move light and easily handled material a short distance between two buildings. One man was needed to feed the conveyor and another to unload it. Formerly one man and a truck had been able to maintain a smooth flow of that material between the two buildings. The new way was the modern but not the common sense way to do the job. It would be easy to recall many similar examples.

"It is high time we definitely learned that management cannot be an exact science. Much time and money has been wasted trying to devise scientific methods which would take away all need for common sense and constant alertness on the part of executives"

One who has observed some efforts at reducing the costs of direct or indirect labor must come to the conclusion that there is a malign power in the phrase, "labor-saving equipment," which all but paralyses the common sense of some men. So possessed do they seem to get with the idea that the only or, at any event, the surest way to save labor is to displace it with a machine, that they fail to consider whether it may not be possible to find a way in which both the labor and the machine may be dispensed with.

A common example is the wholly admirable effort to

reduce material handling costs and to speed up the flow of work. Frequently this is done by installing expensive conveyors or making a heavy investment in trucks—a procedure which is often wholly wise and necessary.

But before making an investment in machinery of that sort which will entail continuing expense for operation, repairs, interest and depreciation, it is the part of wisdom to determine whether at a reasonable initial expense the factory cannot be partly or wholly rearranged so as to reduce the amount of material moving that will be required. Often, as a result, labor will be saved and the initial investment in labor-saving equipment will be reduced by the simple expedient of reducing the amount of work to be done.

¶ "The greatest possibilities of savings today are in the expenditures for white collar and executive work. The waste there is tremendous—and all but ignored"

When such improvements as I have cited can be made in the utilization of factory labor, it seems strange that so little has been done to reduce the tremendous wastes in the usage of white-collar workers. Yet practically no common sense and only a few "scientific" attacks have been made on the vast wastes that exist in this division. There are three principal reasons.

One is that the salaries of the office force are buried in the catch-all of general expense where they are usually successful in avoiding unfavorable attention.

¶ "Much of the office work now being done can be simplified. A large part of it can be bodily yanked out, to the great benefit of net profits"

The second is that it is generally assumed that clerical workers have no brains to speak of. Such efforts as have been made have been largely along the lines of mechanizing office work and office workers. The fact is that there are plenty of brains in most offices. It pays to give them a chance to function.

The third reason is that clerical help has always been considered a more or less necessary, if deplorable, evil. With the development and wide adoption of wage-incentive, cost accounting, production planning and other systems aimed toward increasing the volume and reducing the cost of production, clerical help came to be looked upon as even more necessary and perhaps less of an evil. In any event, the number of clerks grew and grew.

Thus the census of 1900 showed that 5.7 per cent of those gainfully employed in businesses other than agricultural were doing clerical work. In 1920 this percentage was 10.2 per cent. In other words, almost twice as many clerks per productive worker were employed after the lapse of twenty years. That clerical help was then considered less of an evil is shown by frequent statements of men who were supposed to know, that it paid to increase overhead expense greatly in order to operate systems which would cut the direct labor cost.

Condoning the increase in clerical expense as a sound principle inevitably paved the way for uncritical acceptance of new and expanded clerical activities, until in time, and in places, the condition became downright ridiculous. Impressive looking reports were inaugurated which meant nothing, and were not read, but which continued to be compiled.

Elaborate, detailed and highly complicated cost systems were devised and installed. Frills of all sorts were added which were comparable only to the gingerbread trimmings which were at that time considered an essential part of domestic architecture. Executives of certain types seemed actually pleased that they had large staffs of clerks on which to practice their managerial talents.

Much of the office work now being done can be simplified. A large part of it can be bodily yanked out, to the great benefit of net profits. In one concern all periodically prepared reports were subjected to severely critical scrutiny, with the result that twenty were discontinued as valuable only in that they provided employment for 25 clerks.

I happen to know of another which reduced its white-collar payroll $250,000 a year, chiefly by taking out useless frills and by simplifying its office methods. To do this it was not necessary to make heavy investments in labor-saving office machinery, nor to use so-called "scientific" methods of time study, standard setting nor wage incentives for the office force. Common sense was all that was used. Each worker and each job was put to the homely test, "Is the business getting value received from this employee or this activity?" If not, out of the place went he, she or it.

Of late some attempts have been made to apply to office work much the same analysis and methods of speeding production as those developed and used in the factory. In many large offices they have been undeniably effective. But it is a serious question whether the same results could not have been achieved at less cost by the determined application of plain, unadorned common sense. In any event, it is only in the very large offices where great numbers of clerks, stenographers and the like are doing repetitive tasks that it can possibly pay to adopt factory production methods, to schedule the paper work, to time-study the jobs and to install wage incentive plans.

In the smaller office, where mass output of paper work does not exist, such methods are not called for. Yet in any office, no matter how small, it definitely pays to know how much work of any kind a white-collar worker or his sister should do; otherwise there may be five employees in the office to do what would no more than keep three reasonably busy.

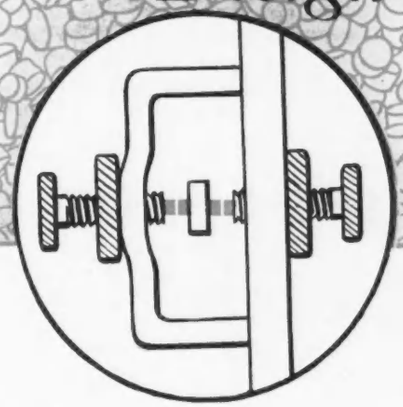
While I am, of course, thoroughly in favor of the use of labor-saving machines in the office where conditions call for their use, I know from experience that they are sometimes installed to do jobs which could either be eliminated entirely or simplified to such an extent that machines would not be needed. There seems to be a type of mind common among second and third string executives that delights in

¶ "There are thousands of men who are called 'executives,' who have never outgrown the idea that business is busy-ness and measure accomplishment by the number of things they do with their hands and feet and mouths rather than with their brains"

shiny, ingenious machines and, disregarding the net results in dollars and cents, considers their presence to be unfailing evidence of efficiency. It is not uncommon for executives of that type to be shown to their amazement and discomfiture that, in places, they are using machines for jobs which undoubtedly could be done much quicker, better and cheaper by hand.

Most businesses could be made profitable if every executive, workman and clerk had to justify his presence on the payroll on the ground that he is giving the stockholders value received.

Design and Metallurgy of Contact Points



RELAYS, fire alarm systems, and annunciator systems are among the electrical products that depend at all times upon reliable contact points to make and break electrical circuits. The author describes the great care that must be taken in selecting materials for and manufacturing of contact points used in electrical apparatus

By EDGAR W. ENGLE
Chief Engineer,
Fansteel Products Co., Inc.

IN certain spots in the south of China there is a rock, loosely scattered on the ground, which is pitted with black ore. Give a piece of this rock to a coolie, and he will go out and match it until he has a basket full, which he will sell to you for the equivalent of a few cents and think that he has done an easy day's work.

Such a transaction as this is the beginning of the manufacture of contact points, for the black ore in this rock is wolframite, a rich tungstate of iron and manganese.

Perhaps it is unfortunate that remote spots of the earth must be combed for suitable contact metals, but when it is considered what these tiny metal discs must do, it is not surprising that only a few rare metals will fulfill the requirements.

Hidden from sight in internal combustion engines and numerous electrical devices are pairs of metal discs, making and breaking circuits vital to the operation of the machine. These circuits may open and close thousands of times a *minute* or only a few times a year, but in any event, the contact points are expected to perform dependably. Should they fail, the whole equipment fails.

Contact points are expected to operate under every conceivable condition. An airplane crossing the Andes, a fire alarm calling frantically for aid, a sensitive relay boosting and repeating an important cablegram, an everyday telephone or automobile — all these depend absolutely upon carefully designed and even more carefully manufactured contact points.

Contact points should not be affected by heat or cold. They must withstand enormous electrical overloads, they must resist the terrific heat of the electric arc, they must be immune to corrosive atmosphere.

They must not stick, for sticking would be fatal. They should not pit, and if they wear at all, they must wear slowly and evenly. They should require little or no attention after installation. In spite of the demands made upon them, they are expected to last a long time—probably as long as the equipment in which they serve.

Furthermore, they should be reasonably low in cost, for, while their purpose is of utmost importance, the user should not be penalized for expensive materials or processes, if contact points of equal dependability are to be had at a lower cost.

You cannot look at a pair of contact points and forecast their performance. Elaborate tests might give a clue, but in the main, the proof of contact points is like that of the proverbial pudding.

The only safe way to buy contact points is to consider the materials used, the methods of design and manufacture, and the reputation of the maker.

Electric welding, as we know, is one of the surest methods of causing two pieces of metal to stick tightly together, and practically all metals can be welded.

The operation of a pair of electrical contact points may be said to consist of two pieces of metal attempting to weld themselves together. All the necessary conditions are present—smooth, clean surface, mechanical pressure, and electric current. But should they succeed in welding, they are worthless as contact points.

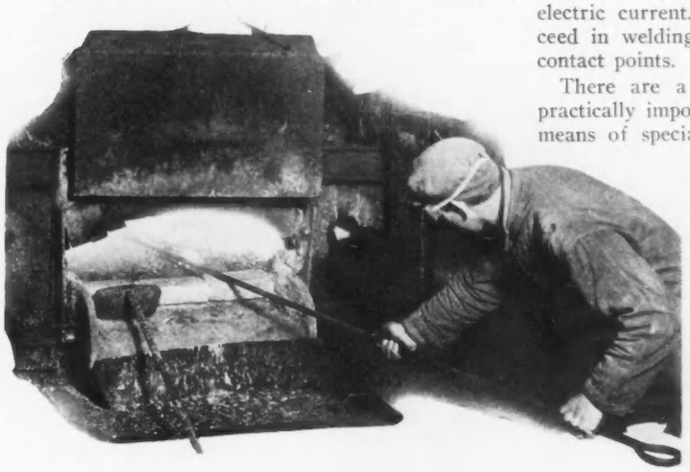
There are a few metals which are practically impossible to weld, except by means of special fluxes. Among these are tungsten, molybdenum and platinum.

Resistance to sticking, however, is only one of the requisites of a contact point material.

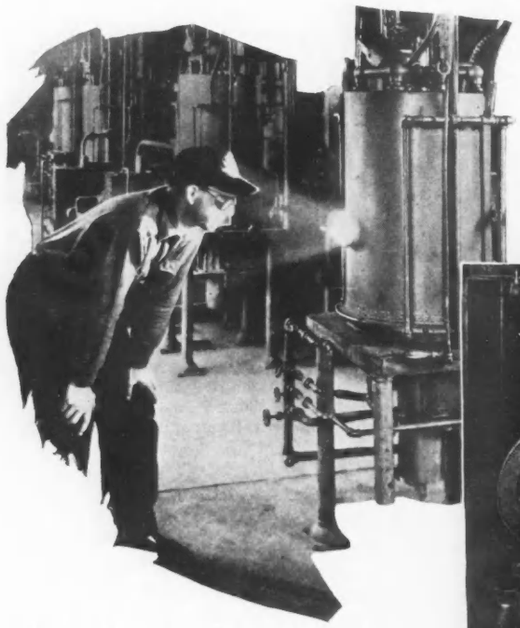
Material for contact points should, in a general way, possess the following characteristics:

It should have a high melting point.

It should be sufficiently hard to withstand wear and impact.



FUSING tungsten ore (wolframite) with soda ash forms a soluble salt which must be purified through several stages of refining before reduced to metal. Pure metal is of utmost importance



THE melting point of tungsten is so high (left) that no crucible will hold the molten metal. Instead pressed bars or powdered metal are "sintered" in electric furnaces, which develops crystal growth. Sintering is done in an atmospere of pure hydrogen

POWDERED tungsten metal (below) is weighed into molds and pressed into bars. The laboratory keeps a record of each bar

It should be a good electrical conductor.

It should have a low vapor pressure.

So far as possible, it should be non-arcing.

It should not be corroded by atmosphere, especially oxygen; or if subject to oxidation, the oxide should be a good electrical conductor and should resist heat and wear.

It should be of fine grain.

It should be free from any impurities which might impair performance.

It should be reasonably low in cost.

Platinum, which was the most widely used contact metal until tungsten came into the field, fills most of these requirements admirably.

Unfortunately, the natural scarcity of platinum and its increasing use in jewelry make it one of the most expensive of metals. Platinum also has the disadvantage of being soft, and usually must be alloyed with iridium, or other materials, to produce a metal hard enough for contact points. And it is difficult to keep such alloys uniform even under the best of conditions. Another disadvantage of platinum is that it is attacked by oil vapors.

Silver is a fine grained metal of excellent conductivity, but it cannot be made hard enough to withstand continued wear and impact, nor is its melting point high enough to withstand the temperatures which may be encountered.

Of all known metals or alloys for contact points, tungsten comes closest to filling all requirements with molybdenum a close second.

Tungsten has the highest melting point of all metals — over 6000 Fahr. It is also one of the hardest of all metals—so hard, in fact, that it cannot be worked or machined cold, and can be cut only with extreme care by a good file or special abrasive wheel. Combined with this hardness is a toughness which enables tungsten to endure impact as well as wear. Ordinary heat does not soften tungsten appreciably.

Tungsten's electrical resistance is only about half that of platinum, and its non-arcing qualities compare favorably with those of platinum and silver. It does not oxidize readily at ordinary operating temperatures.

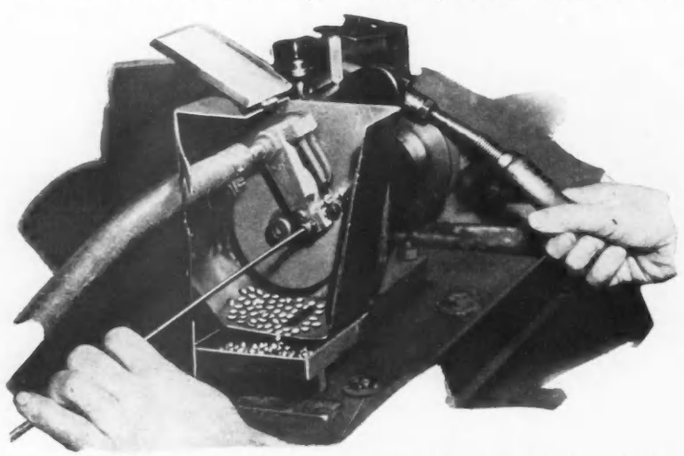
By proper processing, tungsten may be made firm and close grained. For contact points, the metal is refined 99.95 per cent pure, careful laboratory control guarding against the presence of impurities.

Best of all, tungsten, while a rare metal, is not a precious metal. The ore is abundant and the metal comparatively inexpensive.

Makers of contact points often buy their material in metal ingots, powder, or in the form of commercial salts. Experience has taught us, however, that it is advisable to begin with the ore, and that more uniform results are obtained from the Chinese wolframite than from the domestic scheelite, or calcium tungstate.

Because of its high melting point and relutance to react with chemicals, tungsten cannot be refined by ordinary metallurgical processes. Great care must be taken to eliminate impurities.

The ore is converted to sodium tungstate, which when treated with hydrochloric acid



CONTACT disks, sawed from rods rather than punched from sheets, have the advantage of end grain metal as a wearing surface. The sawing is done with high-speed abrasive wheels

becomes tungstic acid. In order to produce a pure tungstic acid, it is necessary to reduce the acid to a salt and reconvert it to acid three times.

Pitting of contact points is usually caused by impurities in the metal, which burn or melt under the intense heat of operation. This often results in the formation of an insulating film on the contact surface, or an irregular grain structure which will cause contact points to wear unevenly. It should be pointed out that these possibilities of trouble are not confined to tungsten alone. Impurities in any metal will cause the same unpleasant results.

Each refining process is expected to eliminate impurities, and to be sure that this is done it has been found necessary to exercise a strict laboratory control over each successive step. Samples are analyzed and studied physically before each lot of material is released for the next process.

The pure tungstic acid is ignited to oxide, which is then reduced to metallic tungsten powder by heating in electric furnaces in an atmosphere of pure hydrogen.

The powder is weighed into a mold, then pressed into bars under a pressure of several hundred tons. Then follows one of the most interesting and complicated processes known in metallurgy—sintering.

It must be remembered that the melting point of tungsten is so high that no crucible will hold it in a molten state, also that oxygen must be kept from tungsten during heat-treating processes. In producing metallic tungsten, therefore, the metal is never actually melted.

The pressed bars are placed in special electric furnaces and heated to incandescence by passing a heavy current through them. This is carried on in an atmosphere of pure hydrogen. Sintering starts a definite crystal growth and drives out any remaining impurities in the metal.

Great care must be taken, however, that only the purest of hydrogen is used, and time and temperature play important parts. So vital is this process that each lot of tungsten powder is studied by the laboratory, to be sure it is suitable for the standard sintering operation.

The metal thus produced is an ingot of pure tungsten slightly larger than a pencil.

Tungsten in the ingot form is exceedingly brittle at room temperature, and requires considerable careful working before a metal suitable for contact points is obtained. This is done by swaging the white hot metal into rods, or rolling it into sheets. Each successive heating and working elongates the grains of the metal, finally forming a tough, fibrous structure.

THIS work is done with greatest care, for should the metal be heated too much, it will revert to the brittle state.

Through several steps, the rods are swaged to the final diameter of the contact points into which they are to be made, or sheets are rolled to the desired thickness.

The majority of all contact points are made of metal discs sawed from rods. This process was invented in the plant of the Fansteel Products Co., Inc., North Chicago, Ill., and all such contact points are made under Fansteel patents.

The tungsten rods are sliced by small abrasive wheels of special material under jets of cold water. Contact points made in this manner have the tremendous advantage of end grain, rather than flat grain contact surface. Such a surface obviously wears better and is more uniform in structure.

This is probably the greatest single improvement ever made in contact points, and is probably the one reason why so very little contact point trouble is experienced in the millions of motor cars.

In such cases as it is of advantage to make contact points from sheet tungsten, discs or other shapes are punched from the hot sheets, and this procedure is generally followed when large discs or irregular shapes cannot be cut economically from the swaged rod.

Next in importance to the contact disc itself is the screw, rivet, rocker arm, or other member which supports the contact point. While purity of metal is not quite so important here, accuracy of dimension *is* paramount, for there must be the possibility of close adjustment.

So far as design is concerned, the support member is equal in importance to the contact disc. Almost any metal can be used. Steel, copper, brass, nickel, monel metal are all being used regularly.

Because of the exceedingly close tolerances necessary, the allowance which must be made for expansion and contraction, and the necessity for fine adjustment, it has been found advisable to machine the screws and rivets rather than make them by ordinary means.

At the Fansteel plant, all such parts are carefully made on modern automatic screw machines, installed for this particular purpose, special attention being given to the accurate cutting of threads.

In making the complete unit contact discs and support members are assembled in carbon jigs, which are placed in electric furnaces and brought up to a welding heat, a thin wafer of pure copper or suitable alloy being used as a brazing material.

"THE only safe way to buy contact points," says the author, "is to consider the materials used, the methods of design and manufacture, and the reputation of the maker. Contact points should be unaffected by heat or cold, non-corrosive and capable of withstanding enormous overloads.

Laboratory control does not end with the production of pure metal. Granted pure metal, contact points would not be dependable if they varied in dimension, or if the surface were not perfectly smooth.

Even with the best of precision machines and highly trained operators, it has been found advisable to subject contact points to no less than four individual inspections.

At the beginning of this article it was stated that performance could not be forecast by physical inspection. Hidden defects might escape even a powerful microscope, but they would quickly make themselves evident in performance.

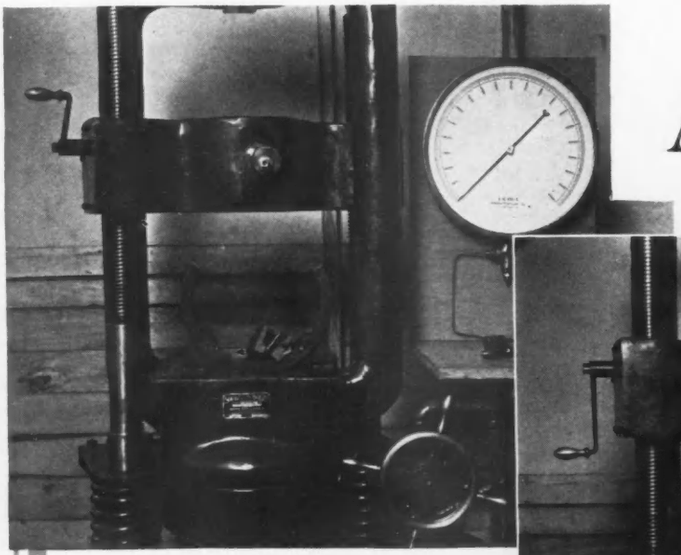
To guard against such hidden defects, a number of finished contact points are selected at random every day and put into laboratory machines which operate them under almost every conceivable condition—varying speed, varying electric current, heavy overload, hot, cold, wet, dry, or corrosive atmosphere. Conditions are purposely made far worse than any encountered in actual service. A trained engineer keeps constant watch over these machines and keeps records of every test.

Aside from careful manufacture and inspection, reputable manufacturers of contact points afford in further protection to users in the form of patents and licenses.

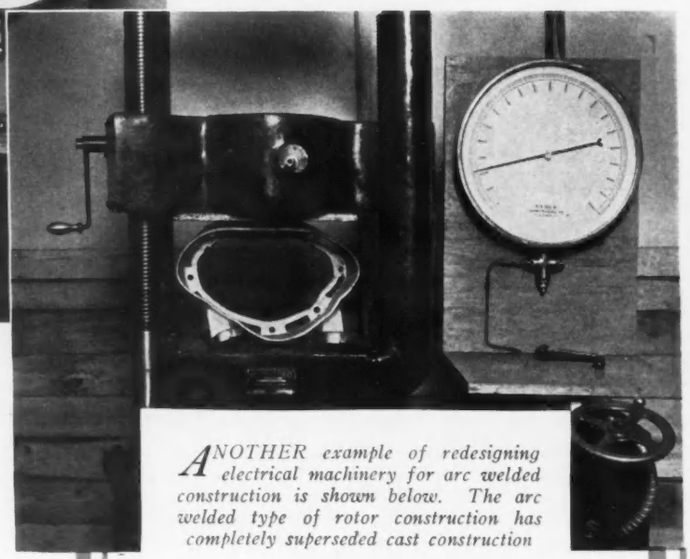
Beginning with the original Coolidge patents covering the refining of tungsten metal, practically every step in the design and manufacture of contact points is covered by patents. Some of these patents are owned by contact point manufacturers. Others—especially those covering design—are owned by manufacturers of equipment using contact points. A goodly proportion of the more important patents

(*Concluded on page* 78)

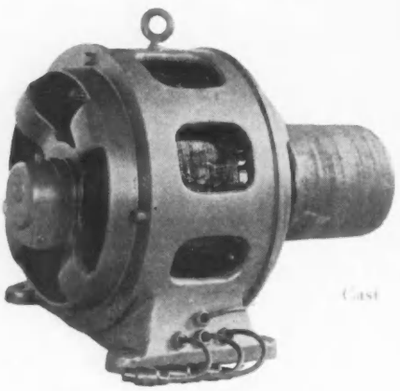
Arc Welding



THIS cast iron ring (above) gave way under a pressure of 4000 lbs. The arc welded steel ring (right) required 11,200 lbs. to crush it. The two rings are for the same size motor



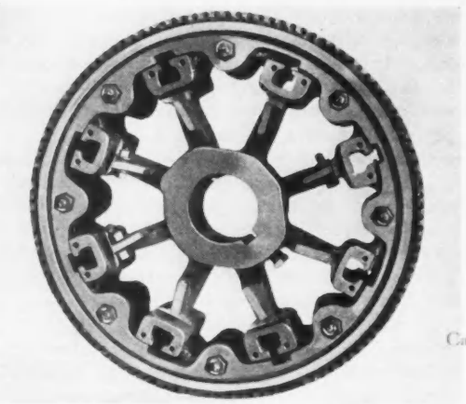
ANOTHER example of redesigning electrical machinery for arc welded construction is shown below. The arc welded type of rotor construction has completely superseded cast construction



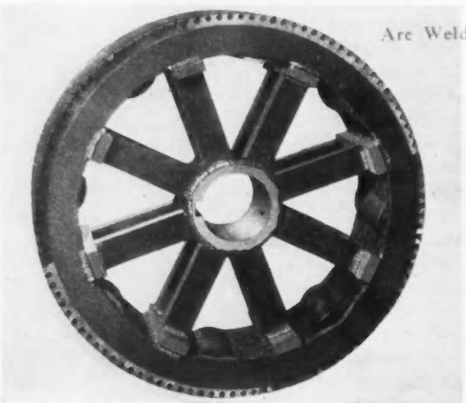
Cast

THESE two motors are designed for the same rating. The cast motor weighs 1687 lbs. and the arc welded motor weighs 1495 lbs.

Arc Welded



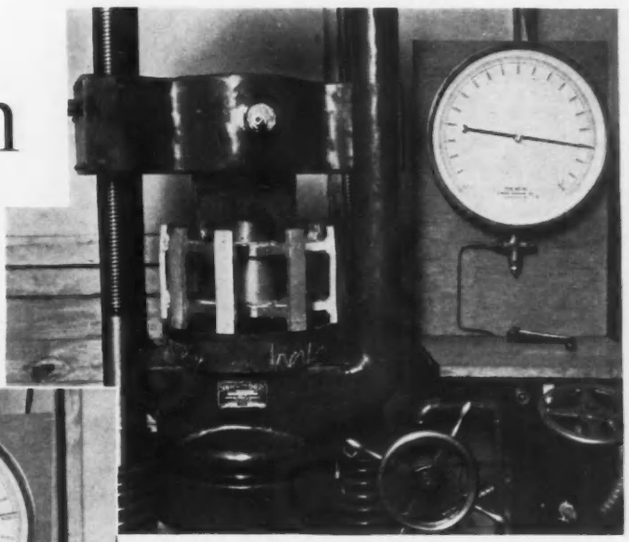
Cast

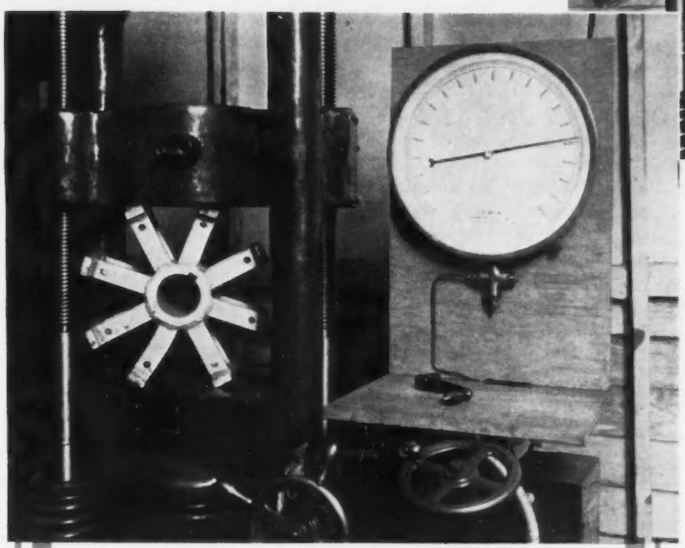


Arc Welded

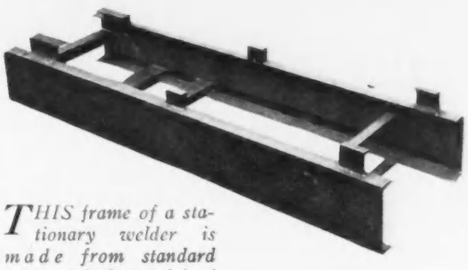
Adds Strength

By A. F. Davis
Vice President, Lincoln Electric Co.





AT 79,000 lbs. pressure the spider at the left showed only the slightest deflection. The pressure being exerted on the arc welded spider above is 85,100 lbs.



THIS frame of a stationary welder is made from standard structural shapes joined by arc welding

EVEN the handle of this truck is fabricated by arc welding. Note also the welded construction of the wheels

FROM time immemorial casting has been regarded as the only successful means of fabricating metal designs. The simple designs of earlier days and the immensely complicated designs of the last several decades were all formed by pouring the molten metal into molds of sand. Then came the discovery of steel and the rolling process. This more modern material, rolled into various shapes, was used to fabricate designs where strength was the prime requisite. These shapes were bolted or riveted together and served their purpose well until the world, as we know it today, found it necessary to intensify its metal structures, within certain limits, rather than extend those limits. And it was surprisingly appropriate that concurrent with this discovery came the inception of electric arc welding.

With the advent of the electric arc welding process the faults and shortcomings of both casting and riveting were emphasized so that this modern process was readily adopted and has rapidly come to the front as a preferred means of fabricating mechanical and structural designs. Arc welding has replaced both cast and riveted construction of many different products in practically every industry. This modern process has replaced cast construction to give added strength and rigidity to a product. Arc welding utilizes rolled steel shapes, fusing the members together at their edges, and making the entire design one integral unit of steel with the joints as strong as the members they join. The appearance of an arc welded machine is as good and often better than its cast iron prototype. Arc welded steel construction is also more economical because steel costs less than cast metal, and there are no patterns required. The design is made up from an ordinary working drawing,

and the metal can be placed just exactly where it is needed most.

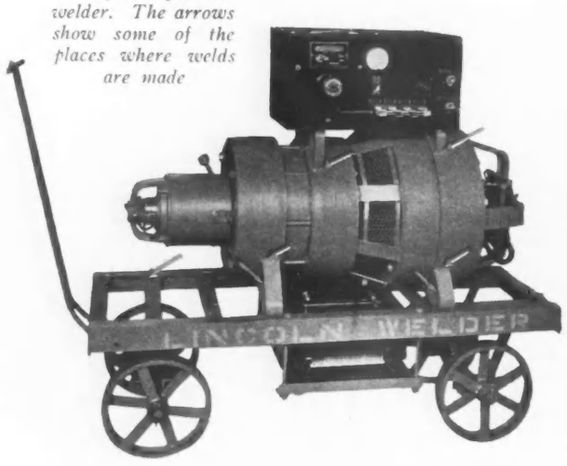
The electric arc welding process has replaced riveted construction because of the added strength and rigidity it affords and because it permits reduced manufacturing costs. With this modern process there is no laying out and punching of the members, which is not only expensive but also weakens the members. This process also eliminates unsightly rivet heads. It fuses the members together, leaving only a slight bead where the members are joined. If appearance is of prime importance these beads may be machined down even with the members they join, making the joints between members scarcely noticeable.

With all these advantages it is only reasonable to expect that manufacturers of electric arc welding equipment should utilize this process in the manufacture of their own products.

Both motors and electric arc welding sets manufactured by the Lincoln Electric Co. have been redesigned for arc welded construction. The frames and canopies of gas engine driven stationary welders are fabricated of steel joined by arc welding. Even the generator is built of arc welded steel construction. At the bottom of this page is shown a 300 ampere, variable voltage, single operator, portable type motor generator welding set that is arc welded throughout. Both the frames of the motor generator set and the truck upon which it is mounted, are fabricated of rolled steel shapes arc welded into place.

The traditional method of fabricating motors and generators is by casting them of iron. Arc welded steel construction has permitted a stronger structure for these electrical machines and has reduced the manufacturing cost considerably. It has also permitted the use of larger amounts of laminated iron and copper, the parts which really do the work in electrical machines.

NOTE the extensive use of the arc welding process in the manufacture of this portable welder. The arrows show some of the places where welds are made



The frames and supports of electric arc welders are also constructed of arc welded steel. For example, the base of one type of welder is constructed of channels, flat bars and Z-bars, all arc welded together. The trucks of portable type welders are also constructed of bars, angles and channels joined by arc welding. The wheels are formed of pieces of channel rolled into a circle and butt welded together. The spokes are pieces of flat bar stock and the hubs are pieces of pipe. The handle of the truck is made from two pieces of bar stock welded together.

The advantages of the electric arc welding process are not confined to the manufacture of welders, however, nor to any other one product, or industry. It is estimated that more than 65 per cent of the products now being fabricated by casting could be manufactured more economically of arc welded steel construction. Practically all products being fabricated of riveted steel construction can also be manufactured by the electric arc welding process with a saving in weight and a saving in manufacturing costs. It is not strange therefore that a manufacturer of electric arc welding equipment should adopt this modern process, insofar as possible, for his entire line of products.

"IT is estimated that more than 65 per cent of the products now being fabricated by casting could be manufactured more economically of arc welded steel construction," says the author. "Practically all products being fabricated of riveted steel construction can also be manufactured by the electric arc process with saving in weight and manufacturing cost"

In the manufacture of electric motors, the traditional method of construction, as we have learned before, was to cast the entire frame and join the various parts by bolting. In the manufacture of our alternating current motors, however, arc welded steel construction is used almost exclusively. The entire frame, including the stator, rotor and end brackets, in many cases is fabricated of arc welded steel.

In one case a standard type motor of cast construction was redesigned for arc welded construction (see page 42). Both of these motors are rated at equal capacities, yet the cast iron motor weighs 1687 pounds, and the arc welded steel motor weighs 1495 pounds.

In building the arc welded steel motor, standard steel units, cut to size and shape, are used. The end rings are formed by rolling angles into a circle, and butt welding the ends together. The bearing housings are pieces of steel plate arc welded together, and are welded to the end rings by means of channels cut to size and shape. The feet of this motor are made from steel plate joined by the electric arc welding process. The end rings are joined by pieces of bar stock. The laminated iron of the stator field is arc welded to the bar joining the end rings.

It is easy to see the enormous amount of work and expense connected with the fabrication of a cast steel rotor, such as shown in the center (right) of page 42. The patterns required to construct this rotor would be very intricate, and this type of construction would require considerable machining. The laminated iron which makes up the "field" of the rotor is pressed between the cast iron frames by bolting.

The construction of the rotor shown at the bottom (right) of page 42 has many advantages over its prototype of cast iron. All parts of this rotor are made from standard steel pieces, cut to size and shape, and joined by the electric arc welding process. Every connection is permanent. In this rotor the laminations are pressed together and held by the rings welded to the spider. They are then arc welded to the rotor frame.

The four illustrations at the top of pages 42 and 43 show the superiority of arc welded construction of electric motors. The cast iron ring of a 5 hp. motor, shown on page 42 (upper left), has been broken under pressure of a hydraulic press. The indicator shows no pressure exerted due to the fact that it returned to zero when the end ring broke. A pressure of 4000 lb. was exerted in testing this cast steel end ring to destruction.

End rings are now made of arc welded steel. They are formed by rolling a piece of angle into a ring and butt welding the two ends together. In testing the strength of a ring made in this way a pressure of 11,200 lb. was exerted before the ring gave way. There was no sign of metal or weld failure after the end ring withstood this tremendous pressure.

The arc welded steel end ring shown on page 42 (upper right), is that of a 5 hp. motor. The broken end ring (upper right) is of a cast ring for the same size of motor.

Advertising in Latin America

By WILBUR T. GRACEY
Twenty-five years American Consul abroad

ARTICLE 4 of a series on exporting electrical products to the twenty republics of Latin America.

ONE of the principal illustrated journals circulating throughout Latin America, and read by the better class of people, recently conducted a survey of its readers to discover that 33 per cent were automobile owners, 87.4 per cent had electricity in their homes, 80.8 per cent were interested in electrical refrigeration, 74.4 per cent were interested in modern bathroom equipment, 81.6 per cent were interested in aviation, 18.8 per cent owned radios and 41.7 per cent intended buying radios, while 66.3 per cent owned their own homes.

While these percentages were given in order to induce advertisers to patronize that particular magazine, they are interesting in that they show the modern tendencies of the better class of people of the larger cities of Latin America.

We cannot deduce from this that the total population of these countries would show anything like this percentage, as we know that there are many places where none of these things could be used, but it does bring us to a realization that in the better class homes there is the same desire for modern equipment as in this country.

Some of the Latin American countries in recent years have spent—and are still spending—immense sums for the installation of electric light and power, and enormous strides have been made with hydroelectric development.

LATIN Americans are most interested in an intelligent description of the goods, which can be given by words when possible, or better by pictures

I would suggest that manufacturers interested in the details of hydroelectric work in these countries should secure from the Department of Commerce the very valuable data which has been compiled on this subject.

In this article my desire is to give the manufacturer who contemplates exporting, practical information regarding catalogs and advertising.

It has been contended, and with some degree of truth, that the expense necessary in translating catalogs into Spanish and Portuguese is largely waste—that catalogs have not the same value as in this country and that their distribution is unduely difficult and costly.

All of these contentions are true to a certain extent, but the preparation of catalogs for the Latin American market can be modified, and they have a definite advantage as they do here, in securing leads for salesmen, creating an atmosphere of confidence in the manufacturer's goods, securing an initial order, and as a convenience to the prospect or customer.

Cautions

1. **Don't translate American catalogs into Spanish.**
2. **Don't have Latin American advertising prepared by an American.**
3. **English catalogs are worthless in Latin America.**
4. **Don't send Spanish catalogs to Brazil.**
5. **Leave nothing to the buyer's imagination.**

It is not necessary to prepare literature in as elaborate a way as we do in this country. Naturally, high class work and expensive printed material will have some effect in winning the respect of the prospective customer, but he is most interested in an intelligent description of the goods, which can be given by words when possible, or better by pictures.

The exact translation of an American catalog into Spanish is unwise and usually ineffective. Something more than this is needed. It is all important that the point of view of the local purchaser be considered and it therefore becomes of the first importance that the material should be *rewritten* from this foreign point of view, and not from the point of view of the American electrical manufacturer.

AS the cost of distribution is high, and heavy import duties are charged on printed matter in most of the countries, it is usually more economical to have literature printed in the country where it is to be used. Sometimes this can be satisfactorily prepared here, by Spanish or Portuguese residents familiar with the language and the foreign point of view, and at other times it had better be left to the foreign agent, especially if he is your own representative.

The preparation of catalogs—and this also applies to other advertising matter—should be prepared by experts, and there are a number of advertising agencies in this country, and abroad, who make a specialty of this foreign language work and have in their employ high class, intelligent South Americans with the necessary literary background to prepare the matter properly.

Do not, under any circumstances, have such matter prepared by an American, no matter how familiar he may be with the language, or how long he may have been resident abroad. It is seldom possible for even a highly educated American to prepare material of this nature which will be idiomatically correct, and have the proper appeal, and in many instances catalogs, and other printed matter translated in this country, loses its effect through errors of phrasing, and has the opposite effect to that intended. Almost every Consul can tell you of American advertising that he has seen which has been prepared in the United

States, and has been passed around abroad as a good joke.

English catalogs, as a general rule, are worthless, they must be in Spanish for most of the countries, and Portuguese for Brazil. The sending of a Spanish catalog to Brazil cannot be too strongly condemned. It is like waving a red flag in the face of a bull. It is strongly resented by the Brazilians who are proud of their Portuguese descent, and its effect will be more detrimental than if an English catalog is sent.

Where catalogs printed in English are necessarily voluminous, some firms have gotten over the difficulty of translation by sending a Spanish—or Portuguese—"key," but this is seldom effective.

Catalogs of a handy size are best and should not contain too large a range. If there are a large number of articles to be described it is better to make separate catalogs.

Absolute accuracy of description is highly essential, because any misunderstandings will arouse complications which may take many months to correct, and possibly result in killing opportunities for future trade.

Leave nothing to the imagination. Assume that the buyer has no knowledge of the articles listed and must be told everything. Give exact data as to sizes, colors, shapes, finishes, qualities, sizes, capacities, weights and measurements, by the metric system, which is the only one understood in Latin America. You should also give full data as to the methods of packing, kind of containers, weights and measurements of same, etc., also in metric figures.

MANY of the popular magazines of Latin America are read by the women even more generally than by the men —useful papers for securing mail-order inquiries for goods that can be sent by post

Exact instructions regarding the method of assembling and method of using the goods is of the utmost importance. Sometimes this information is sent only with the goods, and if by any chance it gets lost, delay and dissatisfaction result. If this information is contained in the catalog as well, it can be referred to at any time.

One of the first essentials in export trade is to foresee every possible difficulty. Sales arguments, for use by agents, is also useful information to be included with your literature.

When catalogs are sent from the United States by mail, a letter should accompany them. These should not be form letters, but should contain a special message to the customer to aid in overcoming any latent sales resistance. It is even wise to have this letter registered. The additional cost will be small and the recipient will consider it a courtesy, which will increase his interest in the literature, and probably result in its retention for reference when otherwise it might be thrown away.

There are several methods of distributing catalogs, and the most economical one must be sought. If any number of catalogs are to be sent out, it will probably be wisest to have your local agent attend to the distribution, shipping the literature to him in bulk. It must be remembered that duty will probably have to be paid on these, and this should be provided for.

If the catalogs can be prepared in the foreign city, a further saving will result, as generally printing in Latin America is cheaper, though not so good as in this country.

When you contemplate mailing catalogs direct to a selected list, by all means have this list checked by your agent, so that "duds" may be eliminated. Furthermore, remember that as duties are charged on heavy catalogs in some countries, even when sent singly, your literature may be refused by the person to whom you send it. Generally speaking, it is unwise to mail catalogs indiscriminately to Latin American firms. Supply them only when asked for, and when the customer is prepared to pay any duty that may be charged.

Usually, it is better to have your agent attend to the distribution of your literature, and he can often obtain entrée and an order as a result of personally delivering such material.

Much more could be written regarding catalogs, but space will not permit, and I recommend to those interested the Exporters Encyclopedia ($20), a complete and authentic manual of the mechanics of exporting, which is almost a necessity in any export office.

Prices should not be shown in catalogs, as this may handicap the local agent. His price will depend on various factors: the current rate of exchange, cost of transporting the goods, time they have been in transit, your credit terms to him, etc., and if the local purchaser has your United States price, he may use it as a basis of calculation and possibly consider that he is being overcharged by the local agent or dealer. Besides, catalogs containing prices are sometimes quickly out of date, and where much expense is involved in distribution, the necessity of replacement becomes important.

Discounts should be carefully quoted so that there is no ambiguity, and it is unwise to use complicated methods of quoting such as 50, 20, 10, 10 and 5 per cent, which is incomprehensible to the Latin, and he may, in error, add these together and arrive at an erroneous discount of 95 per cent as a result. Simplify your discounts as much as possible, allowing sufficient to take care of the intermediate steps of sale.

The Bureau of Foreign and Domestic Commerce can be of great use in supplying lists of dealers in your line, or prospective customers, but these lists should be checked by your agents when possible, as changes are constantly occurring which do not come immediately to the attention of the department.

Other names can be obtained from such publications as the Trade Directories of South and Central America and the West Indies, Kelly's Directory of the World, local directories of the various Latin American cities, lists supplied by the Pan-American Bureau, Chambers of Commerce, Latin American banks, American banks operating in those countries, from the export, class and technical journals and trade associations. These will be supplemented by lists prepared by your agents, salesmen or brokers.

IT is not necessary—and while a very usual custom should not be followed—to write to the American Consuls for names. Such lists as consuls have prepared are always in the hands of the Bureau in Washington and can be obtained without delay by addressing the Bureau of Foreign and Domestic Commerce.

The building of an effective list is a lengthy and costly affair. Only the largest of the corporations have been really successful in preparing such lists themselves, such as Westinghouse International, International General Electric, etc.

As a consequence, publishing firms and other large organizations have taken this up, and for Latin America those publishers who issue Spanish editions of their journals have spent enormous sums in the preparation of lists for their own use, and are now prepared to sell such lists to manufacturers and guarantee their accuracy. Through their foreign connections they keep these up to date, and the small manufacturer will do well to make use of their services, and will probably, in the end, find it cheaper than building his own list.

The future of our export trade in Latin America depends more on intelligent advertising than on anything else. The

Latins are very susceptible to advertising, and American firms who are succeeding in those markets use this method of bringing their goods to the attention of customers almost as generously as in this country.

Advertising throughout Latin America is more simple and less expensive than with us. Certain papers in each country reach the mass of the population, so that a smaller appropriation will be needed.

To reach the dealers, and most particularly the trade in the electrical field, the foreign language journals in the United States are effective, especially those printed in the Spanish language.

There are also a number of Spanish magazines published in this country which circulate in Latin America and are useful in reaching the general public.

In Latin America itself, local papers have extensive circulations, some of which will be mentioned later when I take up in this series of articles the separate countries. The *Cine Mundial* circulates in most of the Latin countries and is a useful media for general advertising, and *La Prensa,* of Buenos Aires, is probably the best newspaper published in South America, and a most valuable means of reaching the people of Argentina.

Most of the readers of these papers are of the well-to-do class, and many of the popular magazines are read by the women even more generally than by the men, useful papers for securing mail-order inquiries for goods that can be sent by post.

Mail order trade is not entirely easy, but in some countries is assuming considerable importance. In some countries the possibilities are more hopeful than in others, Chile, in particular, being one where parcel-post trade is growing satisfactorily. Packages can be sent there C.O.D., which has facilitated the securing of orders. Cuba and Peru are also countries where mail order trade is possible.

It must be remembered that in Latin America there are large numbers of Americans and Europeans employed by the mines, railways and large business houses, some of them living in isolated places, and with this group a large mail order trade can be built up. In fact, in some countries, such as Peru, the native women will order even costly apparel—gowns, millinery, etc.—by mail, and if an electrical product is one which can be sent by mail, there is no reason why a successful trade cannot be built up in this way in most of the Latin American countries.

THE possibilities are, of course, intriguing, as a mail order business can be developed from a very small beginning and local advertising may bring astounding results. Large outlay is hardly necessary. Small, inexpensive catalogs, or leaflets, may be used. The difficulty is to secure a satisfactory list of names, but this is not an impossibility, as many firms have proved, and advertising in such household magazines as *Cine Mundial,* etc., will bring satisfactory results. Names can be taken indiscriminately from directories, and additions to the lists made by making an offer of some little gift to a customer who will send a list of friends. In some places, especially small towns, the mayors, or other government officials, will supply lists of the better class of people, especially if a small discount on goods which they purchase is allowed in exchange for their courtesy.

The catalog make-up is important and the first effort must be toward establishing confidence in your firm. Reproductions of letters of reference, especially if from banks or prominent officials—the mayor of your town, the local postmaster, etc.—are especially valuable.

It is usually customary in case of C.O.D. orders to insist on part payment in advance, helping to protect you and insure acceptance on arrival.

In certain countries surtaxes are charged on mail order packages and in others charges are made on delivery, no matter whether postage has been paid in full or not. These charges should be clearly shown in your circulars, so that there may be no misunderstandings. Of course, your packing must be above reproach. Waterproof material is essential, and the Postal Guide or Exporters Encyclopedia should be carefully consulted for details as to sizes of packages, postal rates and regulations that apply to packages, as these vary for each country.

IT is usually customary in case of C.O.D. orders to insist on part payment in advance, helping to protect you and insure acceptance on arrival

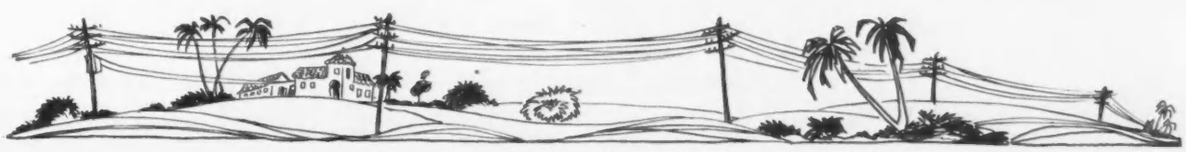
The main difficulty in parcel-post trade is that in many countries customs clearance is complicated. The governments often specify that duties must be paid at places where customs houses exist and when the customer is located at an isolated point and there is no customs office, the goods cannot be obtained until the customer has appointed someone at the port of entry to take delivery for him, which, of course, necessitates additional expense and the remailing of the parcel within the country; also in some of the countries no parcel post or money order arrangements exist.

In these four articles I have tried to give you an outline of the basic necessities in export trade; a book could be written—and many have been—on the subject. The manufacturer who is seriously interested in this trade will by this time have acquired a library on the subject, and in future articles I shall give you definite statistics, data, and information regarding the electrical trade of different Latin American countries, the next article dealing with The Argentine.

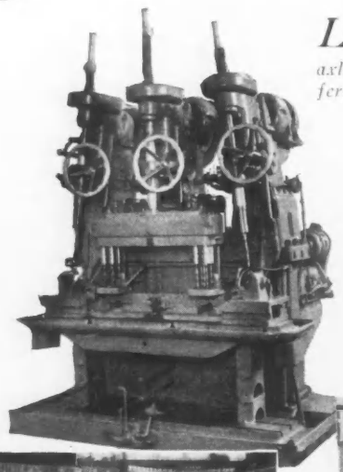
More About Latin-American Exports

MUCH valuable information on exporting to Latin America will be found in the Facts, Figures and Trends section of this issue on page 73. From the standpoint of exports, the most important Latin American country is Argentina, Mexico coming second. During the month of May exports to Argentina amounted to $785,955, and exports to Mexico amounted to $656,659. Our exports to Argentina in May, 1930, were about the same as our exports to the United Kingdom in Europe, and our exports to Brazil were about the same as those to Italy. A careful study of the table on page 73 will give a good idea of the relative importance to us of the Latin American export market.

It is important to note, for example, that exports to Argentina alone are about the same as the sum of exports to Australia, the Philippine Islands and China combined, and that our exports to Brazil are about the same as the sum of exports to Belgium, France and Germany combined. Exports to Spain and Chile are about equal.

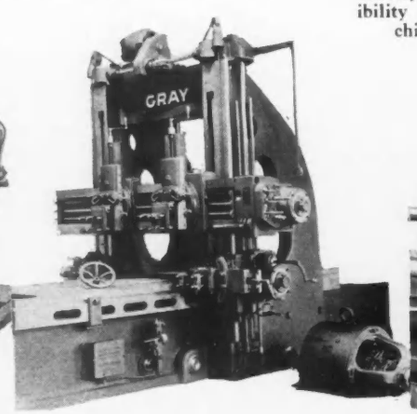


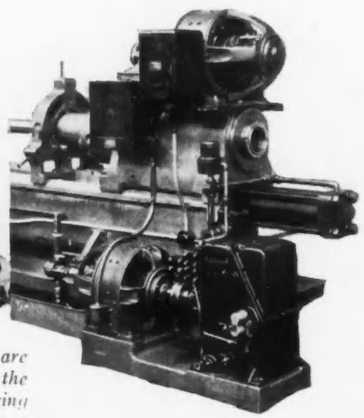
Here's a Market for



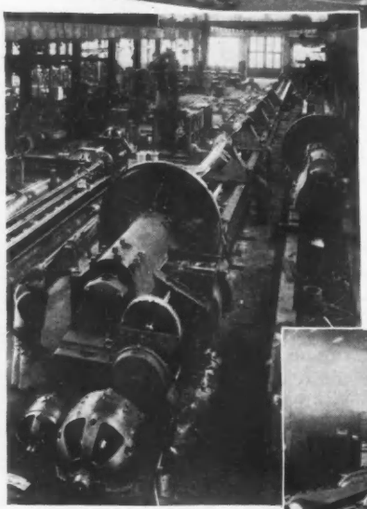
LEFT—This drilling machine is used for drilling front axles of automobiles. Two different sizes of motors are used

MACHINES are now commonly making use of from four to fifteen individual electric motors. This plentiful use of individual motors results in unusually high power flexibility. This flexibility becomes more essential as machines become more complicated



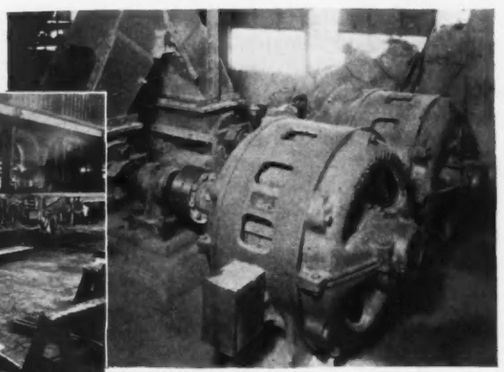


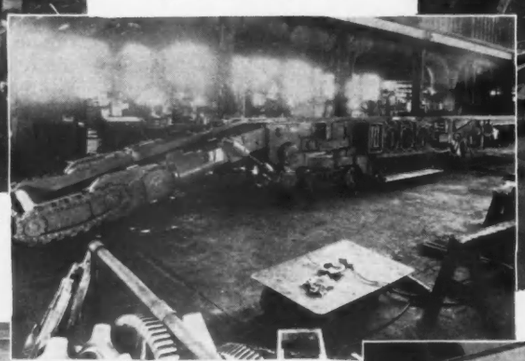
ABOVE—Two motors of different size are used on this planer, one for running the table and the other for raising and lowering the heads. Right—Variable speed motors are used on this boring machine

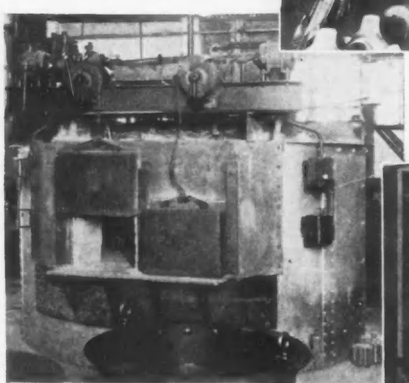


RIGHT—Thirteen motors ranging from 7½ to 20 hp. are used on this largest coal loader

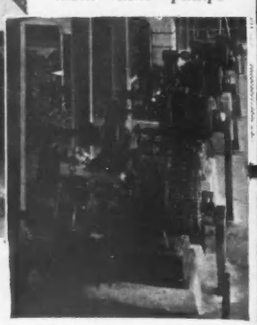
LEFT—Application on one machine of a small and large motor of the same type and characteristic



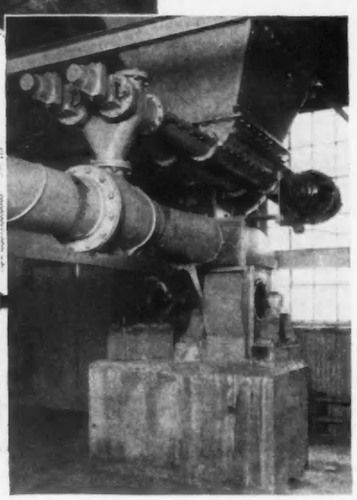




RIGHT center—Two 2200 volt motors driving cement mill pumps



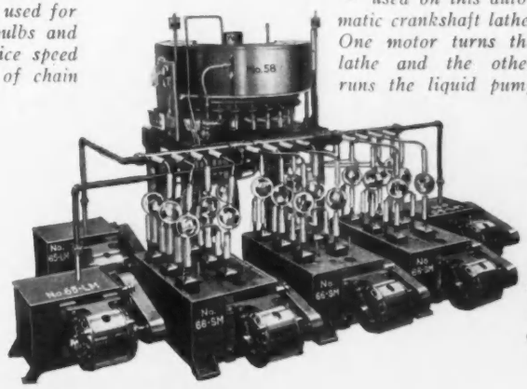
ABOVE—Twin motors used on a rotary hearth furnace. Right—Five motors operating different parts of a paper machine through reduction gears



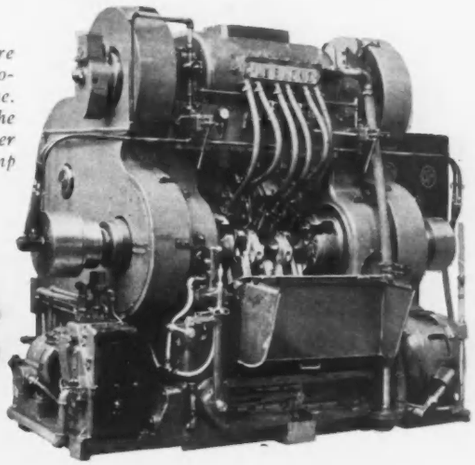
THREE motors are used on this coal pulverizer and feeder, one driving the fan and two driving the feed screws

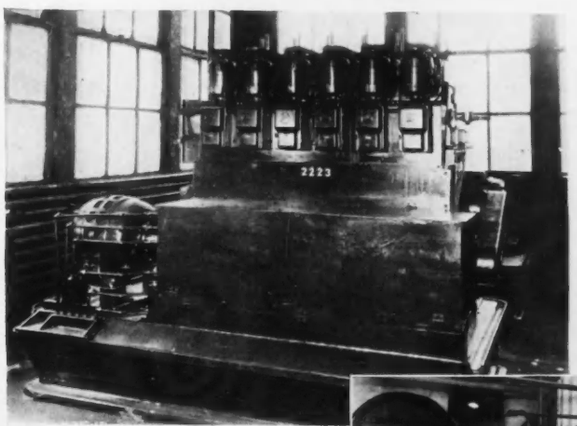
"Multiple" Motors

FIVE motors of identical design are used on this vacuum pump used for evacuating light bulbs and radio tubes. Notice speed reduction by use of chain drive

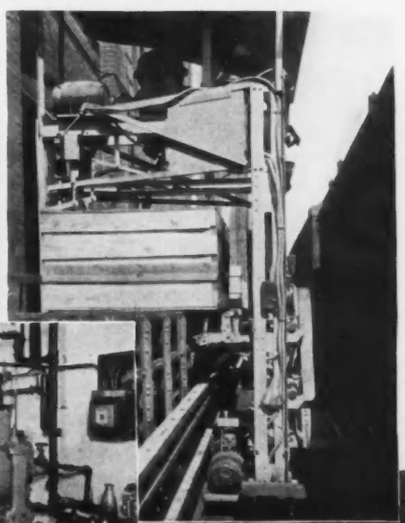


TWO motors are used on this automatic crankshaft lathe. One motor turns the lathe and the other runs the liquid pump

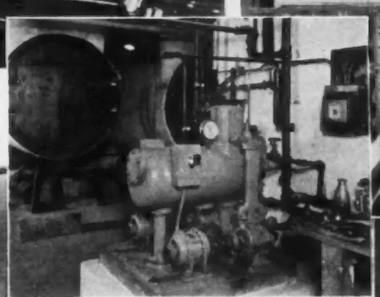


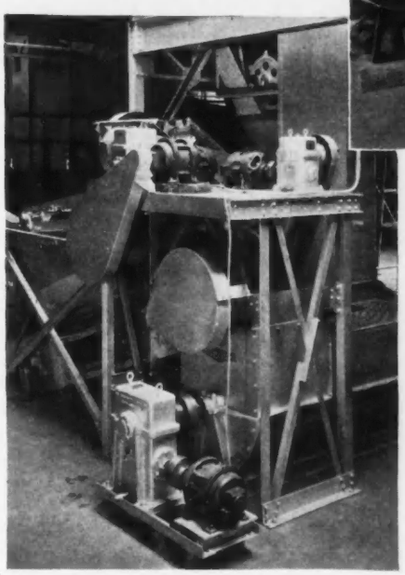


ABOVE—Seven motors are used on this drill press, one 15 hp. and six ½ hp.



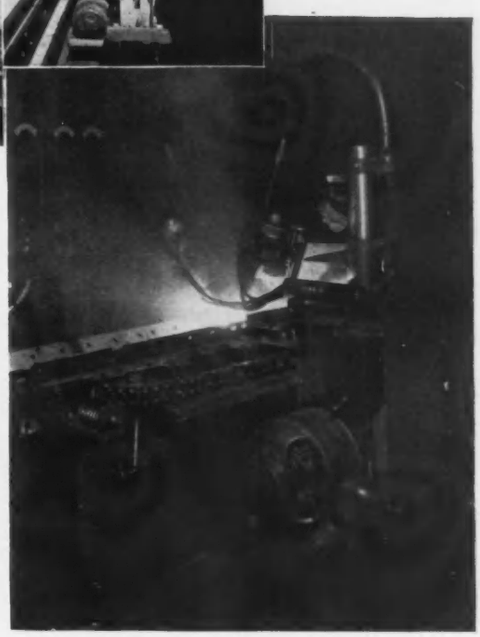
TWO remote controlled motors furnish power for this car loading machine. Both motors are applied through gear reduction units





LEFT—Four motors drive this foundry machine. Notice use of both reduction gears and chain drive. Above—Two identical motors driving pumps

THREE motors used on a continuous type arc-welding machine. One motor drives the conveyor and two motors control the arcs



Plan to Modernize Industries Electrically—

THE Electrical Association of New York launched in March of this year a modernization of industries campaign which includes both a drive for remotorization, and replacement of other outworn electrical equipment in industrial plants throughout the Metropolitan district. The plan is successfully under way in New York and is now being started in Boston. It is expected to become nation wide

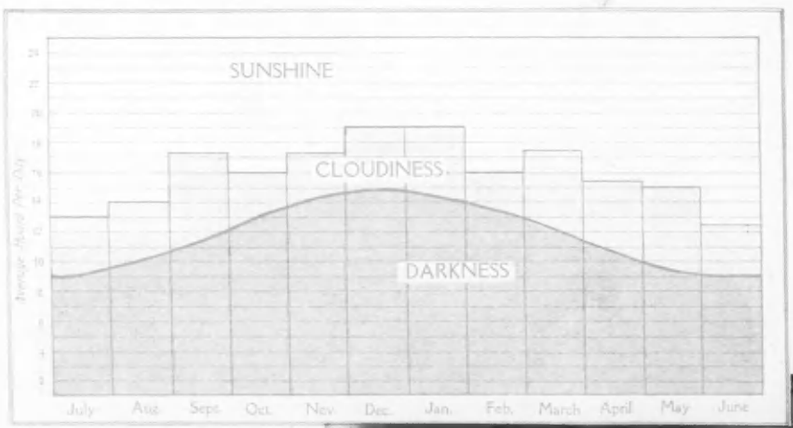
ALTHOUGH electrical manufacturers are at all times devoting the maximum effort to promote the wide and proper use of electrical apparatus in industries of all kinds, it is logical that the sum total of this effort can be made much more effective if it is organized. The present electrical modernization movement has been organized on the theory that the most effective means of increasing the use of electrical apparatus in industry is to combine the efforts of the electrical manufacturers, electrical wholesalers and electrical contractors into a concerted effort toward a common end.

This is an opportune time to promote such a plan because now the desirability of operating at the highest possible efficiency is evident. Everyone in industry is "on his toes" to cut costs, and it is at a time like this that industrial managers are receptive to new ideas.

Facts are wanted, facts which show why old electrical equipment should be replaced with new, which show conclusively that it pays to light properly, to ventilate with modern equipment, to control heating systems electrically, to apply motors more scientifically, to apply improved control equipment where old fashioned equipment is now in use and to introduce more elaborate control systems where more cumbersome systems of control are now in use, to handle more materials and products by machinery instead of by hand, and to install more flexible systems of signaling.

Now is the time for electrical manufacturers to gather these pertinent facts and present them in attractive and convincing form for the use of wholesalers and contractors. Capital for the modernization of industries is available. There remains for the electrical manufacturers, wholesalers, and contractors the task of supplying the incentive to invest this capital profitably in electrical equipment.

Every cooperative movement depends for its effectiveness upon the extensive support of those concerned with the movement. The electrical modernization movement, although of direct interest to electrical wholesalers and contractors, is of immense importance to electrical manufacturers and highly dependent for the best success on the manufacturers' support. Many manufacturers are already showing a keen interest in the movement and are highly desirous that it be extended nation-wide. Surely it deserves the most careful consideration.



Illumination

THERE is a definite relation between light and production in industrial plants. Artificial illumination deserves the serious thought of every factory executive. The accompanying chart suggests the great amount of artificial illumination that must be provided. If improved lighting is a logical expenditure, electrical manufacturers should be the first to "light up"

ELECTRICAL manufacturers are showing great interest in the electrical modernization movement. It is the first plan that has been devised for bringing concerted effort to bear on the sale of electrical equipment of all kinds for the modernization of all types of industrial plants. It bids fair to improve the sale of electrical equipment even during a period of relative depression. A complete set-up of the plan is given on the next two pages of this article

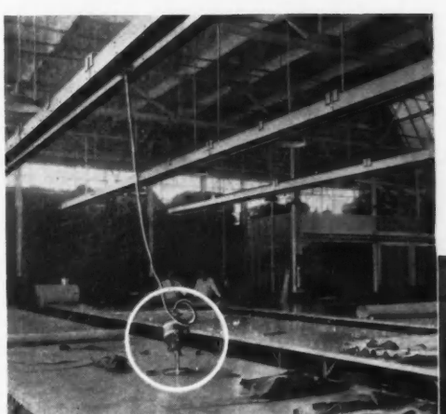
For Example:

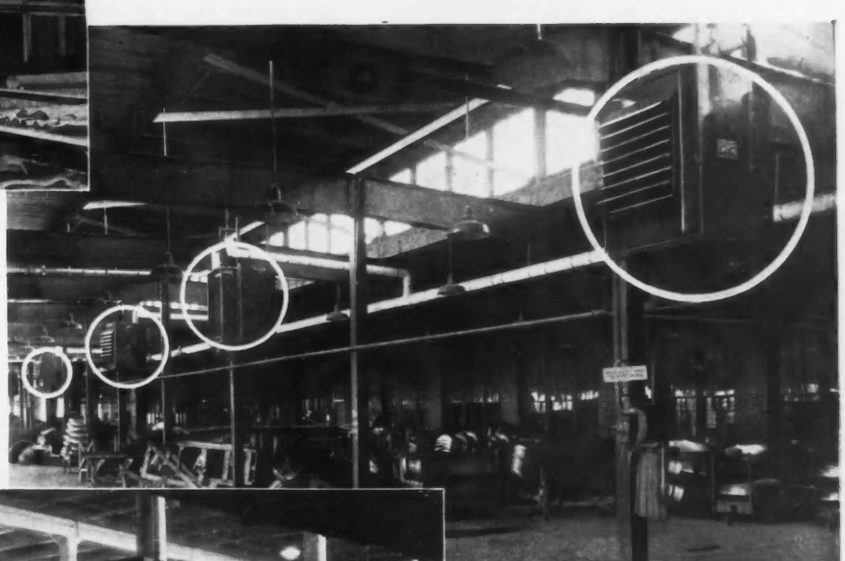
Ventilation

HUMAN efficiency holds a prominent place in modern manufacture, and one of the factors of greatest importance is adequate ventilation

Power Outlets

RAPID changes in products require frequent and varied changes in manufacturing facilities. This requires mobility in electrical installations



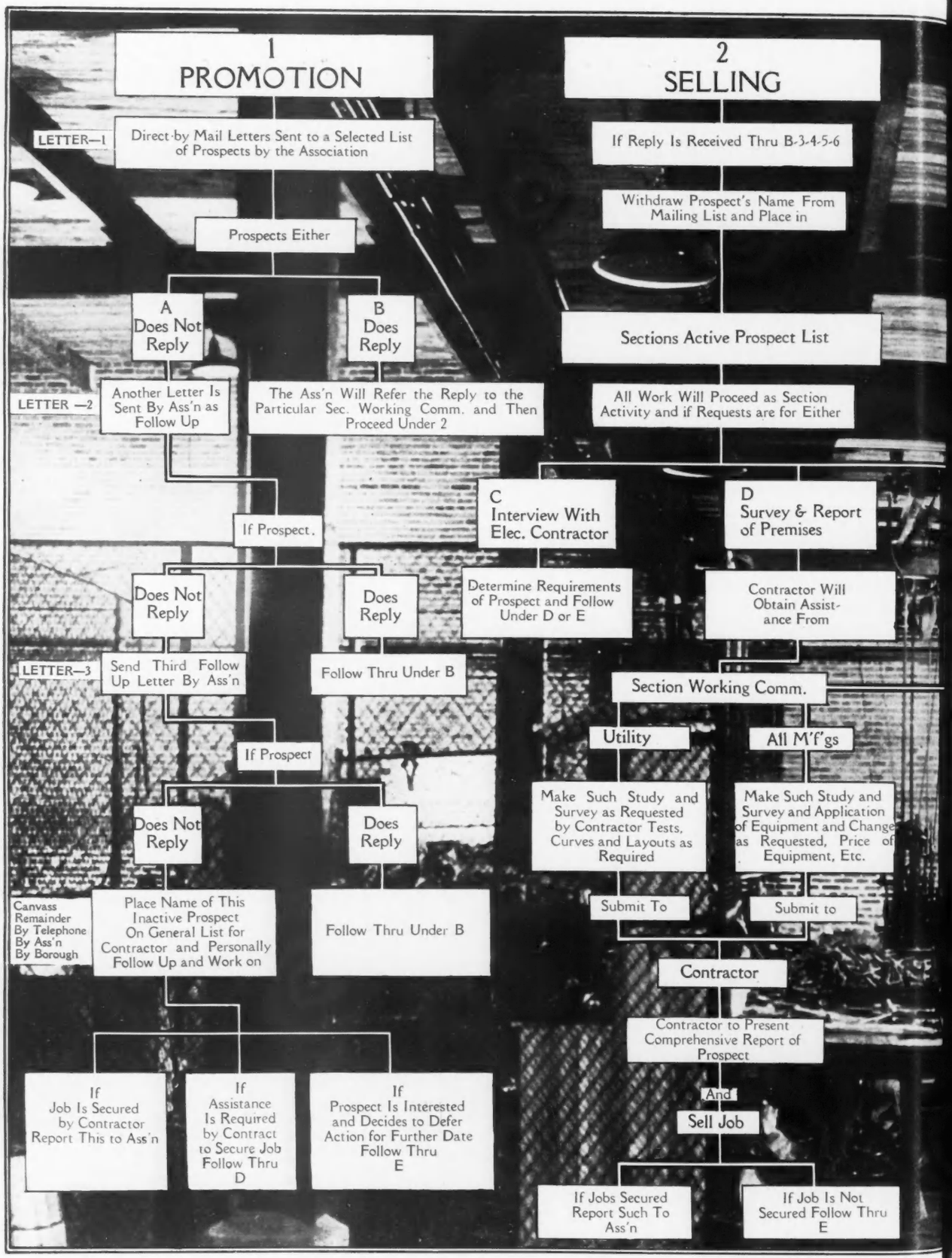


Controlled Heat

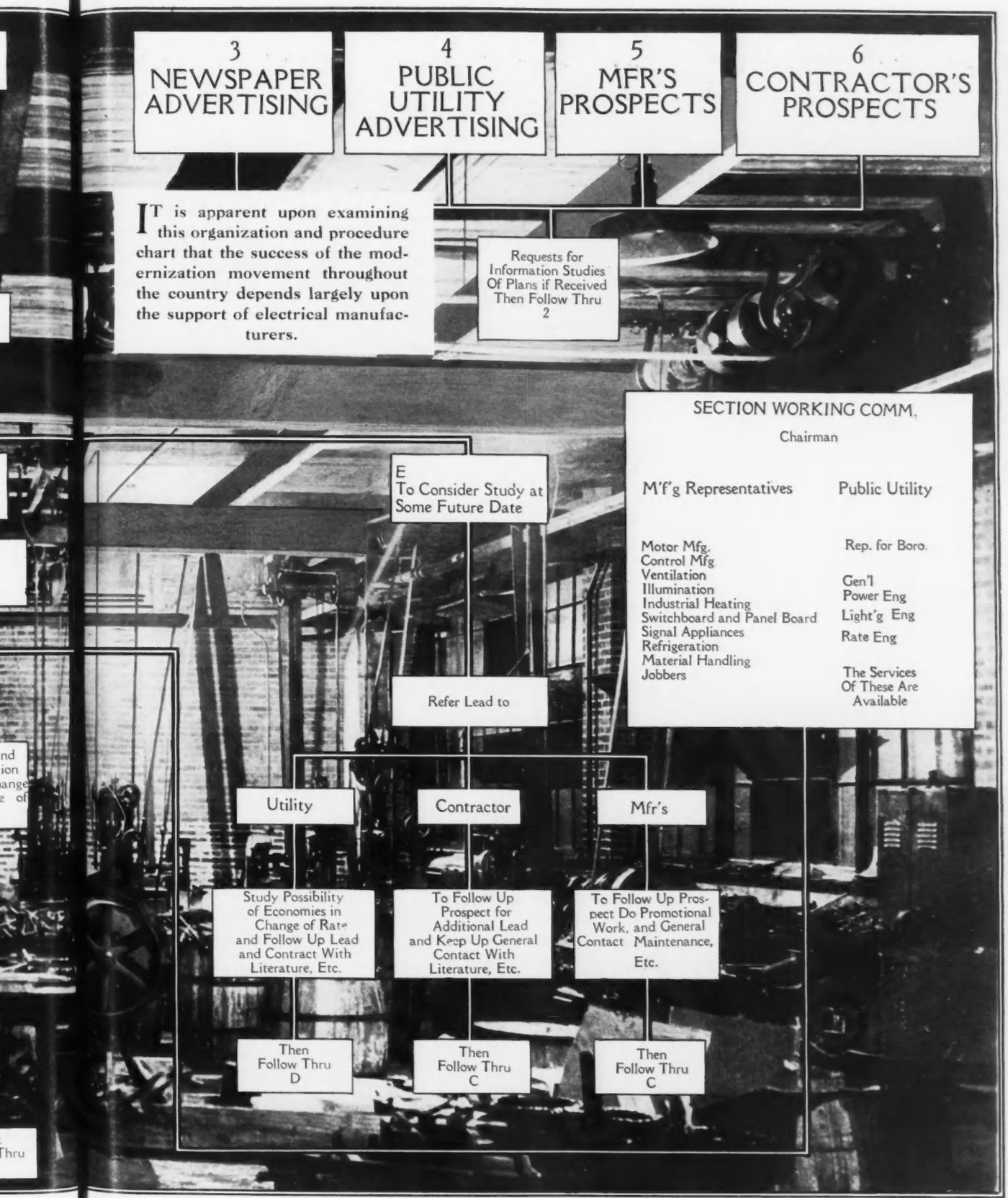
ALERT factory managers are being induced to replace outworn heating installations with electrically operated systems. Buildings are thus filled with circulating fresh air of exactly the right temperature and humidity

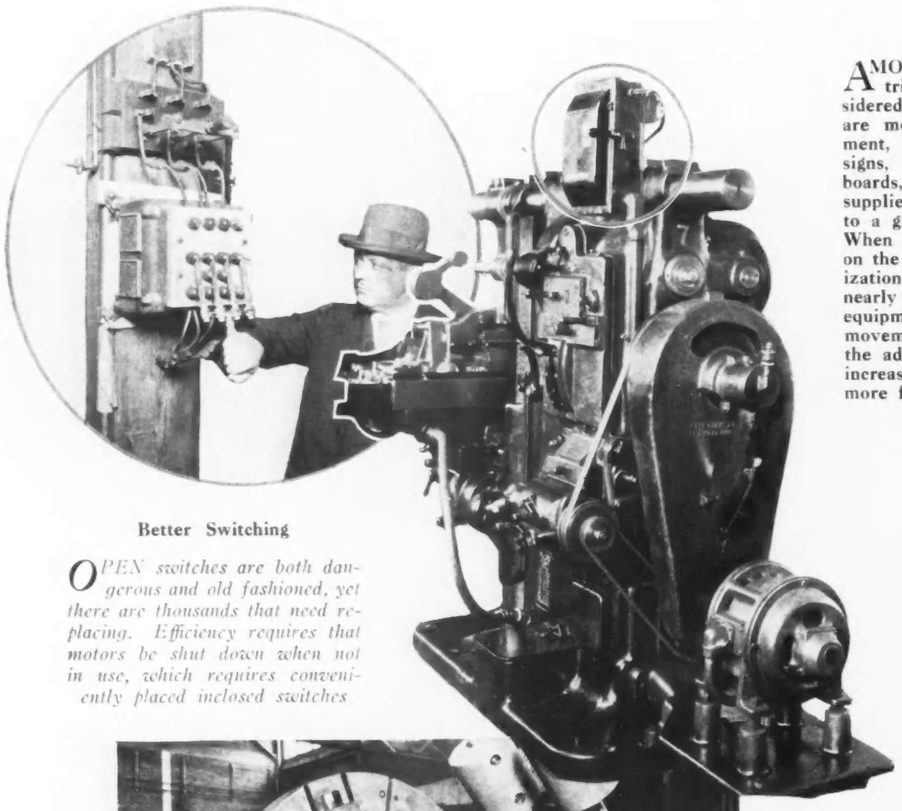
Conveyor Systems

MECHANICAL handling of materials, partially finished and finished products on electrically driven conveyors has become a fine art. Nearly every industrial plant has room for great improvement in material handling methods


1
PROMOTION
2
SELLING
LETTER—1
Direct by Mail Letters Sent to a Selected List of Prospects by the Association
Prospects Either
A
Does Not Reply
B
Does Reply
LETTER —2
Another Letter Is Sent By Ass'n as Follow Up
The Ass'n Will Refer the Reply to the Particular Sec. Working Comm. and Then Proceed Under 2
If Prospect.
Does Not Reply
Does Reply
LETTER—3
Send Third Follow Up Letter By Ass'n
Follow Thru Under B
If Prospect
Does Not Reply
Does Reply
Canvass Remainder By Telephone By Ass'n By Borough
Place Name of This Inactive Prospect On General List for Contractor and Personally Follow Up and Work on
Follow Thru Under B
If Job Is Secured by Contractor Report This to Ass'n
If Assistance Is Required by Contract to Secure Job Follow Thru D
If Prospect Is Interested and Decides to Defer Action for Further Date Follow Thru E
If Reply Is Received Thru B-3-4-5-6
Withdraw Prospect's Name From Mailing List and Place in
Sections Active Prospect List
All Work Will Proceed as Section Activity and if Requests are for Either
C
Interview With Elec. Contractor
D
Survey & Report of Premises
Determine Requirements of Prospect and Follow Under D or E
Contractor Will Obtain Assistance From
Section Working Comm.
Utility
All M'f'gs
Make Such Study and Survey as Requested by Contractor Tests, Curves and Layouts as Required
Make Such Study and Survey and Application of Equipment and Change as Requested, Price of Equipment, Etc.
Submit To
Submit to
Contractor
Contractor to Present Comprehensive Report of Prospect
And
Sell Job
If Jobs Secured Report Such To Ass'n
If Job Is Not Secured Follow Thru E

Electrical Manufacturing, August, 1930, Page 52


3
NEWSPAPER ADVERTISING
4
PUBLIC UTILITY ADVERTISING
5
MFR'S PROSPECTS
6
CONTRACTOR'S PROSPECTS
IT is apparent upon examining this organization and procedure chart that the success of the modernization movement throughout the country depends largely upon the support of electrical manufacturers.
Requests for Information Studies Of Plans if Received Then Follow Thru 2
SECTION WORKING COMM.
Chairman
M'f'g Representatives
Public Utility
Motor Mfg.
Control Mfg.
Ventilation
Illumination
Industrial Heating
Switchboard and Panel Board
Signal Appliances
Refrigeration
Material Handling
Jobbers
Rep. for Boro.
Gen'l Power Eng
Light'g Eng
Rate Eng
The Services Of These Are Available
E
To Consider Study at Some Future Date
Refer Lead to
Utility
Contractor
Mfr's
Study Possibility of Economies in Change of Rate and Follow Up Lead and Contract With Literature, Etc.
To Follow Up Prospect for Additional Lead and Keep Up General Contact With Literature, Etc.
To Follow Up Prospect Do Promotional Work, and General Contact Maintenance, Etc.
Then Follow Thru D
Then Follow Thru C
Then Follow Thru C



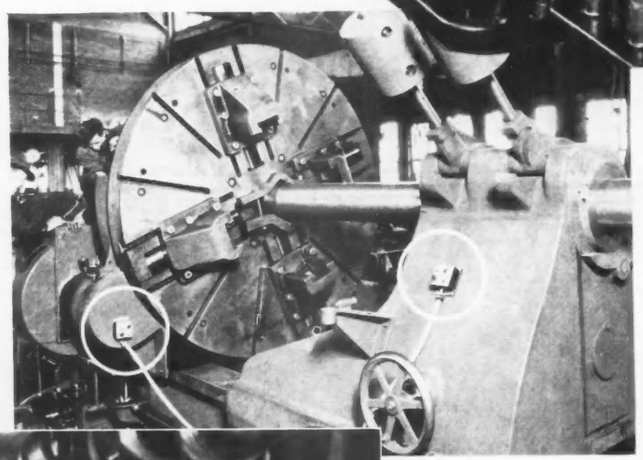
AMONG other types of electrical equipment to be considered in modernizing industries are motors, refrigeration equipment, signal systems, electric signs, switchboards and panel boards, electric tools, and wiring supplies. Each of these hinges to a great extent on the others. When an industrial plant is sold on the idea of electrical modernization, it becomes a market for nearly every class of electrical equipment. The modernization movement is designed to make the advantages of improved and increased electrical applications more familiar to industrial managers

Better Switching

OPEN switches are both dangerous and old fashioned, yet there are thousands that need replacing. Efficiency requires that motors be shut down when not in use, which requires conveniently placed inclosed switches

Remote Control

LARGE machines and machines with many motors are made easy to control by the installation of push-button controllers at different points (left center)

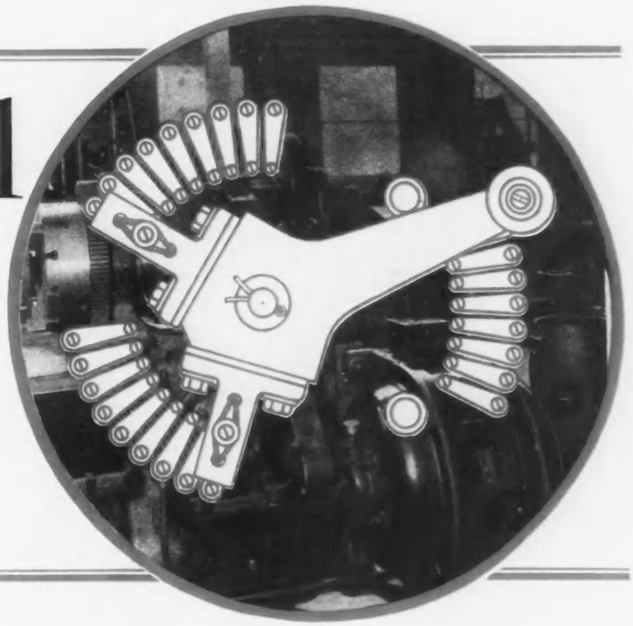


A LARGE store of facts concerning the electrical modernization of industries have been gathered together by the Electrical Association of New York into a handbook. Experts in the various branches of electrical application have here summed up briefly the advantages of modernizing electrically

Individual Motor Drive

NUMEROUS applications making use of line shafts and belts could be more efficiently carried out by localized motorization and control

Industrial Control



By W. C. YATES
Industrial Department
General Electric Co.

THE advantages of electric motor drive of industrial machinery are, in general, well understood and the rapid supplanting of other kinds of power units is a matter of record. As soon as reasonably well-designed motors were available, their advantages over other kinds of drive were easily demonstrated. One particularly important factor was the ease with which the motor could be controlled. This, with other advantages, influenced the early introduction of motors to drive line shafting, replacing steam engines, ropes, belts, etc., and has become the prime consideration in the application of the electric motor to the individual drive of industrial machines.

Great Advance in Control Equipment

Much of this evolution can be attributed to the improvements made in the characteristics of the so-called "general purpose" motors, as well as to the development of new types especially suited to some particular application, but it may not be fully appreciated how much is due to the still greater advance in the developments made in the controlling devices and equipment used with these motors.

Industrial Controllers, a term embracing all such devices and equipments, exist in such an astonishing variety of types and forms as to confuse anyone not an expert in this field. The selection of a proper motor for a given service, apart from that of a very special nature, is a relatively simple matter and concerns chiefly the power available, the work to be done, and the general conditions surrounding the installation. While this is usually given intelligent study, it is often true that the controller is chosen with less care and understanding.

It is not sufficient that the controller will permit the motor to go through its desired performance. Consideration is due the wearing qualities of the device; the safeguards afforded the motors, the machine, and the material handled; the elimination of hazard to life and limb; the convenience as to installation, inspection and repair; the economies of operation and other factors that merit attention. The consideration that merits least attention is that of first cost. The controller for a motor driving a given machine plays ordinarily a very minor part in the cost of the complete installation, but its failure in any way to maintain service or to get the best work out of the equipment will quickly counterbalance any false economy in its selection.

It appears therefore that it is worth while to understand better the Industrial Controller in its seemingly endless variety and complexity. A study of what it has to do and the various methods of accomplishing the results will make relatively simple the selection of the right device for almost any service except that of a highly special nature.

Having chosen our motor in view of the power supply and the characteristics it must possess to meet the service requirements, let us select our controller. This cannot be done by going through a list of the various types available in their many combinations, but we can bring up one after the other the fundamental considerations and arrive at what we are searching for by a process of elimination. Let us first consider duty.

By the "duty" we mean the specific functions for which the controller is designed. Is it merely to start the motor and is the load to be accelerated light or heavy? Or is speed control desired and if so by what method? The motor must largely tell us whether the method is to be by armature or field rheostat, winding or voltage change, brush shifting, etc.

What Are the Motor's "Duty" and "Service"?

Must the motor be reversed and throughout the entire speed range? Must it be brought to rest quickly and is a "solenoid brake," "dynamic braking," or "plugging" best?

By "service" is meant the specific application in which the controller is to be used, for example:

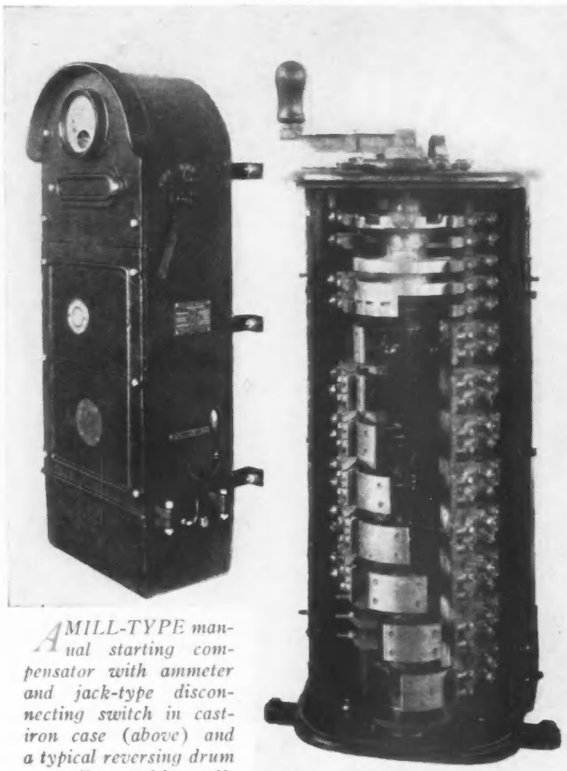
(a) General Purpose, which covers occasional starting of motors.

(b) Special purpose, which covers a long list of applications, such as cranes and hoists, elevators, printing presses, rubber mills, each of which demands some distinctive feature in the control in the way of capacity, specific functions, and other points considered later in this discussion.

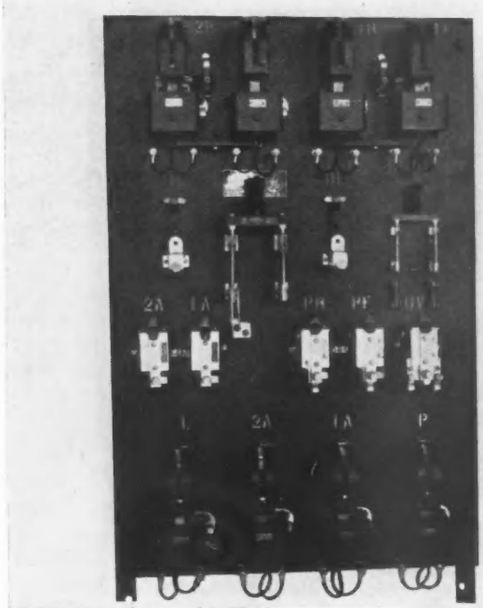
The following is a tabulated summary of the protective features that may be essential. Several of the items could be discussed at length to advantage, particularly those concerning ways and means to secure adequate overload protection, the relative merits of various motor starting methods, and the advantages of the several automatic accelerating schemes.

(a) Overload Protection.

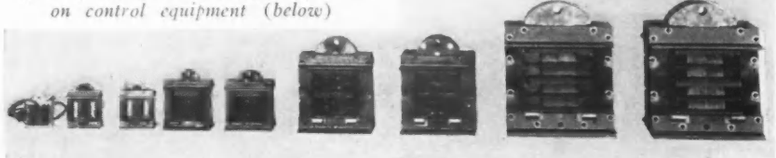
The motor should be safeguarded against injurious overload. This may be accomplished by:



A MILL-TYPE manual starting compensator with ammeter and jack-type disconnecting switch in cast-iron case (above) and a typical reversing drum controller with self-aligning fingers (right)



STEEL mill auxiliary reversing magnetic controller for series motor (above) and a line of solenoids for use on control equipment (below)



1. Fuses (these have definite limitations as to protection afforded.)
2. Circuit-breakers.
   Instantaneous and time-element.
3. Relays affecting contactors.
   Instantaneous and time-element.
   Hand, gravity and remote reset.
4. Thermal devices.

Theoretically ideal overload protection is accomplished by a device that will follow the temperature of the motor as caused by the load upon it, and which will function to disconnect the motor when unsafe temperatures are approached. Thermal devices are available which will accomplish this with more or less exactness and the general run of motor starters and controllers are now found to be equipped with such devices.

(b) Under-voltage release.

Motors that can not be thrown directly on the line in safety to themselves should have starters equipped with Under-voltage release.

Under-voltage devices that operate instantly on cessation of voltage may be found objectionable on lines where brief power disturbances may occur because of the disconnecting of all the motors on the line when there is really no need of it.

Time delay under-voltage release devices are available which will not trip the controller unless the voltage failure continues for an appreciable period. It is generally considered that 1½ seconds is about the right delay to provide.

(c) Protection against too high inrush and shock to machinery.

1. Starting resistance, d-c and a-c.

Recognized standard capacities and ratings of starting and intermittent duty resistors will be found in the American Standards on Industrial Control sponsored jointly by the American Institute of Electrical Engineers and the National Electrical Manufacturers Association.

2. Compensator starter, a-c.
3. Y-Delta starting, a-c.
4. Reactor starter, a-c.
5. Prevention of too quick reversal of motor.

Does Controller Meet Regulations?

Regulations covering the amount of inrush current permissible for motors on power lines will be found in the Standards of the National Electric Light Association. Special regulations will also be found in force issued by central stations operating network systems for light and power.

(d) Protection against too rapid acceleration.

Too rapid acceleration may be the cause of heating or sparking of the motor, or of undue shock to the driven machinery and the material or fabric handled by it.

Ways and means of prevention are:

1. Time limit acceleration.
2. Current limit acceleration.
3. Acceleration controlled by voltage change across armature or resistor.
4. Field accelerating relays.

(e) Protection against overtravel of machinery.

1. Limit switches.
2. Overwind device.

(f) Overspeed protection.
(Required only in special cases.)

(g) Phase reversal and phase failure protection.

(h) Sudden strengthening of field at high speed will result in a voltage jump that must be taken into consideration in some instances.

For many reasons (humanitarian, economic and legal) much attention is

given to the safety precautions surrounding industrial machinery and this is particularly true of the electrical equipment where we find many safety features embodied in up-to-date control that afford security to the operator, repair men, and other persons. Some of these features are:

Undervoltage protection automatically prevents the motor from restarting, without personal intervention, after failure of power. The casualties that might result from the unexpected starting of machinery are obvious. Phase-reversal protection is essential for elevators and other machines where unexpected motor reversal would be hazardous.

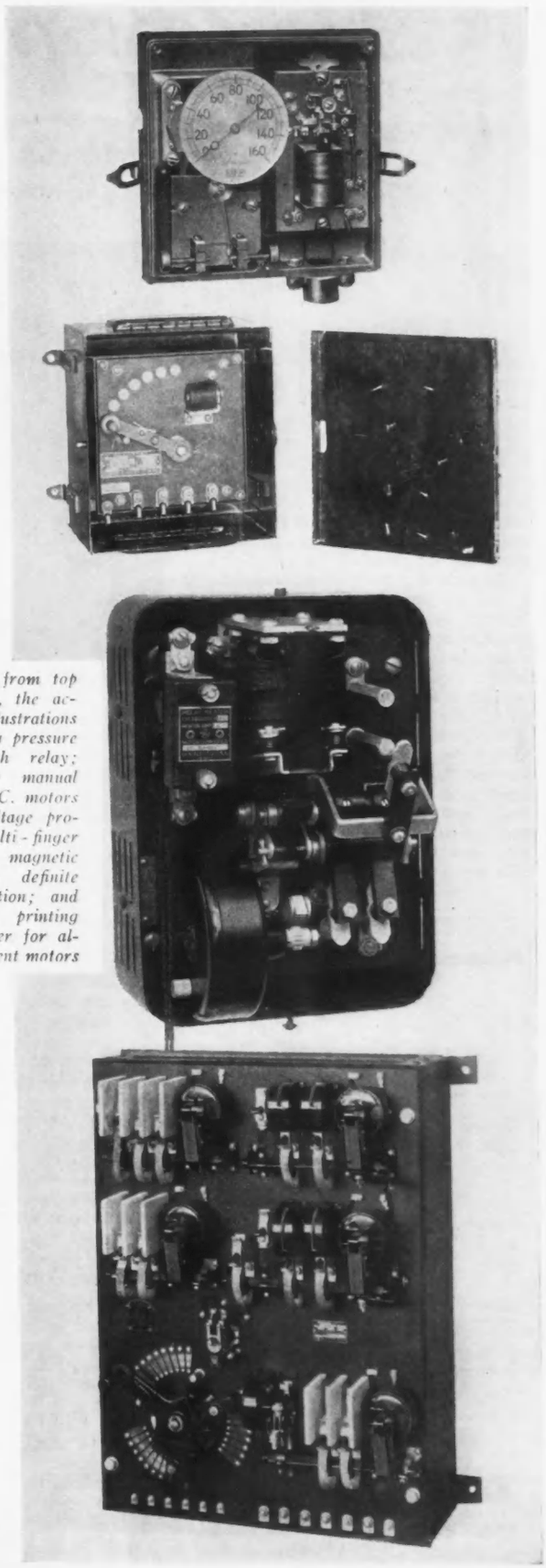
No Excuse for Open Starters

Enclosure of the live and working parts of the control equipment, as a safeguard against shock or burn, is now the rule and there is no excuse for the installation of open type starters or control of any kind except where isolated and accessible only to qualified persons. Suitable enclosing cases also exclude inflammable dust and will prevent the arcing of the controller contacts from being communicated to an explosive atmosphere.

Locking features are available to prevent operation while work is being done in inspecting, cleaning, adjusting, or repairing the machine or its equipment. Where a machine, such as a printing press, is controlled from several stations, it is possible at any station to lock against operation from any other.

Emergency stops in case of need can be provided to shut down the motor from any given point and to quickly stop it by braking or plugging. Limit switches to prevent overtravel as for elevators, cranes and valves, and devices to prevent overspeed in handling dangerous material such as molten metal are an every-day requirement.

There exist safety codes of national, state and local character that deal more or less fully, as the case may be, with regulations to eliminate hazards. None of them, fortunately, demand anything beyond what is reasonable. The National Electrical Safety Standard sponsored by the Bureau of Standards at Washington under the procedure of the American Engineering Standards Committee is the product of the best engineering and thought on the subject and is generally recognized as the most comprehensive and most reasonable compendium of electrical safety regulations.



READING from top to bottom, the accompanying illustrations are: indicating pressure governor with relay; safety type manual starter for D.C. motors with undervoltage protection; multi-finger type D.C. magnetic starter with definite time acceleration; and preset speed printing press controller for alternating current motors

The following is a list of special conditions surrounding the installation which may require special protection of the controller:

(a) Prevalence of gas or acid, as in mines, chemical works, etc.

1. Protection of controller from corrosion.
2. Suppression of arcs that might ignite gases.

In this connection the Standards of the Bureau of Mines will be found of interest.

(b) Mills handling powder, sawdust or other explosive or highly inflammable material—suppression of arcing.

(c) Protection from water.

1. Splash-proof.
2. Moisture-proof.
3. Immersion-proof.
4. Special protection from action of salt water.

(d) Fire prevention measures in general (See Underwriters' code.)

In selecting the controller best suited for the purpose in mind its convenience to the operator should not be overlooked. Particularly with machinery, the work which requires constant attention, it is important that the operator find the control within easy reach and manipulated with

(*Continued on page 70*)

Ready to Apply

Eleven liftable ideas for cutting costs or simplifying the day's work of the electrical manufacturer

They Make Poor Team Mates

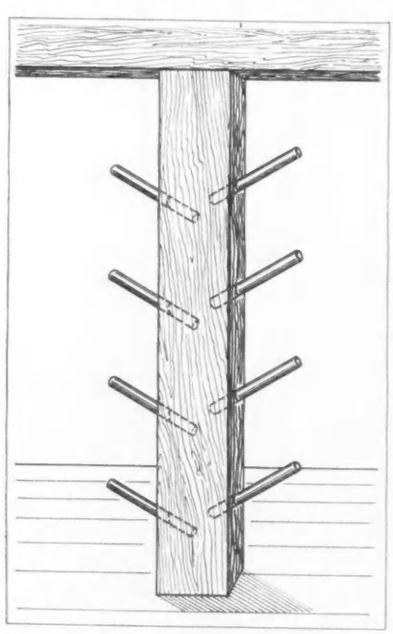
"DO NOT spray oil base materials and lacquer in the same spray booth," says E. H. Bucey of the Brevolite Lacquer Company. "Cases have been known," he continues, "where the oil base materials have ignited spontaneously, and then the fire has been fed by some of the lacquer being used there.

"Then there have been several lacquer fires in factories which have been traced to the use of defective exhaust fans. In other cases there was not sufficient clearance between the tips of the fan blades and the duct wall, causing friction and eventually sufficient heat to start a fire.

"In general, it may be said that the type of exhaust fan where the propeller blade is in the path of the fumes, but where the motor or other propeller mechanism is outside, is safe." E. H. B.

A Rack That Will "Stay Put"

IT IS sometimes dangerous to attach a rack to an ordinary wall and then pile heavy materials on the rack. It is poor practice because a "one-sided" pull is created. Such a load is an "eccentric load," and eccentric loads on columns or walls sometimes end in disaster. If a similar rack could be attached to the other side of the wall and both sides loaded equally and simultaneously there would be no eccentric load and the possibility of collapse would be materially lessened.



Because the Load Balances

A rack constructed in this manner will hold a large load safely

Below is a sketch of a strong rack that has been used successfully. Heavy materials have been piled on it—pipe, bars, angles and lumber—and it has not yielded in the least.

To make a rack of this kind, bore holes in sturdy upright timbers at a slight angle, as indicated in the sketch. Insert short pieces of pipe to fit nicely in the holes, as shown; fasten the vertical timbers both at the top and bottom, and you have a good serviceable rack, capable of holding a tremendous load. By placing shelves on both sides and then loading both sides, the desired balance is obtained. W. F. S.

He Only Starts It

The operator of this full automatic arc welding machine is required only to start and stop it. Automatically it welds boiler and end plates into one continuous piece

Good for Any Bulletin Board

OF GOOD use in any factory house organ or on any plant bulletin board is the following item which appeared in the shop paper of the Fairbanks, Morse Company's Indianapolis plant:

"Would you buy clothing from a store that had dirty floors and windows, and where their stock was kept in a topsy-turvy manner? Would you not think that if the owners of the store were careless in their methods of neatness that they were also careless in their methods of doing business?

"By the same sign, should not a customer of electrical machinery judge the manufacturer by the appearance of his shop? Don't you think that the impression on the customer would be much better if the shop was clean and orderly with everything in its proper place?

"A neat and orderly shop has the double advantage of favorably impressing the visitor and of making work easier for the workman. If everything is moving smoothly and if all stock can be quickly located, there is no lost time or confusion. Lost time does not add to the income of either the shop or the workman; therefore it is an economic loss.

"The management has charged each of us with the responsibility of seeing that we be neat and orderly in our work. By so doing we will contribute our part to the Quality Campaign." W. B. T.

Skid the Load and the Job Is Easy

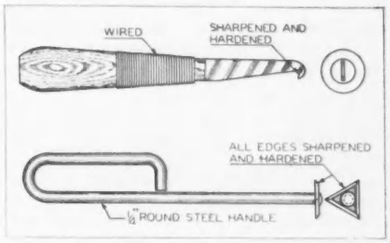
THERE are many firms still moving heavy machinery by using a force of men to roll the load over heavy iron pipes a few feet at a time.

That is more expensive by far than the method used by a Cincinnati firm which makes bulky laundry machines. Here they bolt the big machines to a pair of skids —resembling sled runners and enough clearance is provided to roll a lift truck under as is pictured below.

A single quick pull of the handle forward raises the machine from the floor, and it is quickly moved by one or two men to the freight car. When you compare that with the old way of tugging and pushing and the generous use of crowbars, it

Better than Pinch Bars

A little foresight in skid planning enables the use of a lift truck



For Commutator Maintenance

These two tools are easily made, yet very handy for cleaning commutator slots

looks like an important matter. The time savings are close to 80 per cent.

Many large units of electrical machinery that are now difficult and expensive to move can be hauled around with ease if they are mounted on skids. T. F. M.

Two More Commutator Tools

IN THIS department last month were pictured two tools which included pieces of hacksaw blade for use in commutator maintenance. Above are two more simple hand tools which may easily be made up for removing slivers of mica which are not removed by the under-cutting saw.

H. C. K.

Not Always Home Talent

IN ONE Chicago plant experience showed it to be a good plan to have outside men come in to the plant safety meetings to tell their experiences in the work. These men were invited from other plants in the neighborhood. The product manufactured might be quite different, but often the safety measures found effective in one plant will work in the other also.

W. B. T.

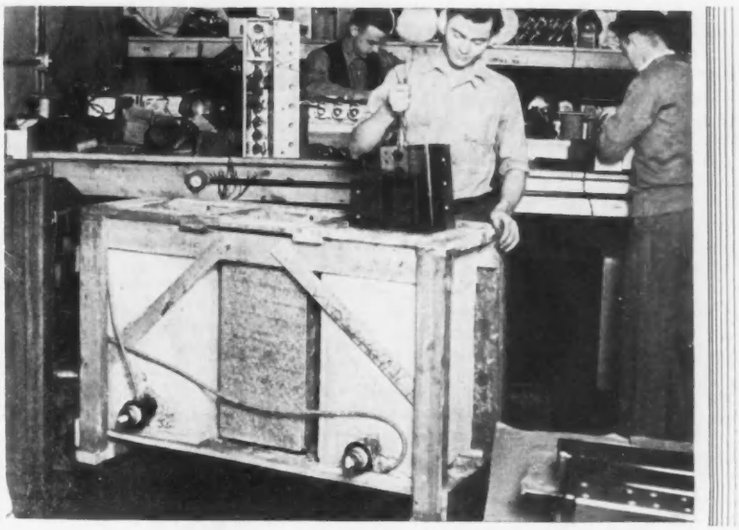
For Handling Wire Scrap

HERE'S a neat method of handling wire scrap in use by one electrical manufacturer, and there's no muscle work connected with it for an electric lift truck does the lifting and carrying.

This portable bin is of sheet steel, and as the illustration below well shows, is mounted on steel legs to raise it to the proper height for use with the lift truck.

A Bin You Can Move Around

A lift truck moves it, and there are doors at the end for easy loading and unloading



Bringing the Tool to the Job

Where the size of equipment will permit, and where it is more or less self contained, it may pay to make it portable as is the case with these electrically heated dip tanks for holding cleaning solutions. Their use is explained fully beginning in the lower right corner of this page

The front of the bin is equipped with an upper and a lower hinged door. When empty the upper, or even the lower, doors are opened. As it fills up the doors are closed, and since the top is open, final filling is from the top. Similarly the doors come in handy in emptying.

This particular bin is used by this company for collecting and temporary storage of short lengths of wire scrap. It would serve equally well for other scrap or for storage of bulk parts. J. W. T.

Perhaps you too have worked out little cost-cutting plans which are of value. If so, turn them in for use in this idea-exchange—a feature appearing each month in ELECTRICAL MANUFACTURING *under this heading "Ready to Apply." Ideas accepted will be paid for at a liberal contribution rate.*

Largely Due to a Packing Plan

A PHILADELPHIA equipment firm has gained an envious reputation for prompt service to its customers. The unusual type of service has had perhaps as much to do with the steady growth of the business as any other factor.

In the first place, the firm endeavors to keep a complete replacement stock on hand, and because of its system of perpetual inventory, this is not difficult. It requires an unusual demand to deplete the stock of any item.

The customers have found that the firm may be depended on to rush out a "hurry order" the same day the order is received, providing it arrives before everybody has left the factory building.

A few years ago the firm made a move that had a wholesome effect on service, which up to that time had not been anything to brag about. It was decided to use fiber cartons as well as the wooden cases then in use for packing shipments. These came in several sizes, knocked down, and anyone about the plant could pack a repair order quickly and satisfactorily. Previously it was not an easy matter to get an order packed in a hurry, because the man that made the boxes had other duties and was often very busy with them. Sometimes last-minute rush orders were held over until the next day.

With the coming of the fiber cartons, and also some stout cloth bags, the average repair order wanted in a rush went out in quick time. In this case an improved packing plan boosted the service very materially. T. F. M.

Applying Immersion Heaters to Dip Tanks

AFTER punchings have been spot welded at one radio manufacturing plant, they are dipped in the tanks pictured above to remove greases and foreign materials from the steel before they are lacquered.

One tank contains a solution of Okonite, the second water which is at room temperature, and the third hot water. The punchings are first dipped in the cleaning solution which is kept at a temperature

just below the boiling point. Then the punchings are dipped in the center tank for washing. Then they are dipped in the third tank of hot water to further remove the cleansing solution from the pieces and to bring about a more rapid drying after they are removed.

Immersion electric heaters have been installed in the two end tanks of heated liquid and those tanks heat insulated. Separate switches control the heaters independently of one another so that the liquid in these tanks may be maintained at different temperatures if desired.

Since the tanks are mounted on casters and the heater current is brought in on flexible cable, these tanks may be conveyed to various parts of the plant where they are needed—a very flexible arrangement. W. H. S.

An Intelligent Painting Program

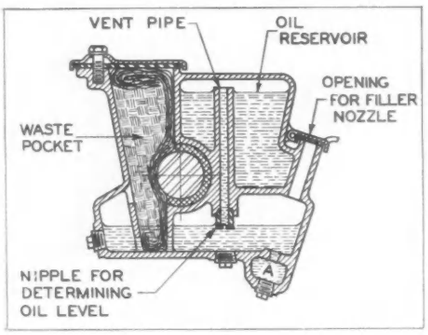
IN former days one mid-western electrical manufacturing concern had no definite repainting program. It did try to apply a new coat where the needs were greatest, but undoubtedly there were sections which were slighted far longer than they should have been. So about two years ago there was put into operation a definite painting program.

According to this program the interior of every building on the average is to be repainted once every seven years. Some sections, of course, require treatment oftener, and some may go 10, 12, or even 14 years untouched. It all depends upon the conditions surrounding each individual case.

The seven-year figure is no scientifically worked out number, nor does it necessarily represent the period of time that this company will adhere to: it was merely picked out of the air as a reasonable starting figure.

On exterior painting, where preservation is the important point, repainting must take place whenever the surface demands it. This concern has fixed upon two to three years as the frequency of exterior painting. But as in the case of interiors, not all surfaces require equal treatment. Quite obviously unusual exposure to sun, wind and weather require that surfaces so exposed have considerably more frequent painting.

On this exterior work this company likes to apply the paint in the fall when the surfaces are all dried out rather than in the spring.



CONSTANT level waste packed railway motor bearing. These bearings are self-regulating, maintaining an approximately constant depth of oil in the waste chamber until the supply in the large capacity oil reservoir is exhausted. The filling chamber (A) connects directly with the oil reservoir by a passage not shown

Plain Bearings for Electrical Machines—II

By G. A. UNGAR, M.E.
Consulting Engineer

THIS is the second article by Mr. Ungar on plain bearings. The first article, discussing periodically lubricated bearings, appeared in the July issue. This article discusses continually lubricated bearings and finish of bearing surfaces. A third article will appear in an early issue

BRONZE bushings pressed into place should always be finished after pressing in. Light press fits and securing by dowels or keys are preferable to heavy press fits without dowels or keys, since heavy pressures will set up stresses especially in thin walled bushings which will be released if the bearing should run hot. This will cause the bushing to close in on the shaft and result in scoring or seizing when the bearing cools. Bronze bushings rolled from flat sheets require only light press fits without doweling, since the finish burnishing operation expands the bushing, anchoring it into the surrounding shell.

Hardened steel bushings should be ground and lapped after they are heat-treated. Because of the expense involved, hardened steel bushings are therefore used only in exceptional cases.

Hand-poured babbitt liners are finished by boring and scraping, reaming or broaching, or by burning in. Die-cast bearings are finished by the same methods or very satisfactorily also by burnishing as described above. It is necessary to anchor the bushings solidly against axial displacement, since the burnishing bar should provide a surface compression of from 0.002 to 0.003 in.

Before pouring the babbitt into the shells they should be aligned as carefully as possible. This is done in order to reduce machining to a minimum because the surface near the mandrel provides a better bearing due to the chilling effect. Furthermore, there must be homogeneous contact between lining and shell, to avoid premature destruction due to the penetration of lubricant and the setting up of hydraulic pressure to the load on the bearing.

SHAFT MATERIAL is usually determined by mechanical considerations of strength and deflection and also of cost and electrolytic considerations. Wherever possible, hardened and ground shaft surfaces should be provided and if this is not possible, a smooth finish, free from toolmarks, should be aimed at. Railway motor shafts are ground to

size and to produce a smooth surface are rolled between polished and hardened steel rollers.

From the standpoint of bearing wear, there is little difference between case hardened low carbon steel and heat-treated alloy steel as long as the hardness figures are the same. For shafts where extreme resistance to wear is desired nitrated aluminum alloy steels properly heat-treated and ground will be found to be highly satisfactory, especially in conjunction with lead bronzes or with cast iron.

Stainless steels which are now available in readily machineable condition are satisfactory for shafts exposed to the action of water, vapor or acids. They can be used in annealed form or preferably heat-treated and ground.

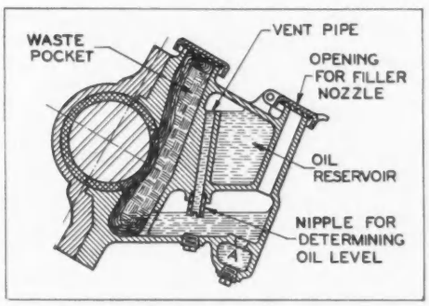
MECHANICAL STRENGTH—The bearing dimensions of electric motors and generators are to a certain extent determined by the shaft extensions which have been standardized by the National Electrical Manufacturers Association. The association also makes certain recommendations for the use of outboard bearings for larger units. No standardization of bearing sizes proper is available so far due to differences in the design of the various manufacturers.

The bearings should be designed so as to provide a minimum of deflection under extreme load conditions and also with due regard to the pressure between shaft and bearing necessary for proper film lubrication and for minimum wear when only partially lubricated.

THE deflection of the shaft in its bearing should be limited to such an extent that under no circumstances the oil film thickness at any point when running is less than 0.000025-in. for precision bearings or babbitt lined bearings and not less than 0.0002-in. for bronze bearings with an initial clearance between shaft and bearing of 0.010-in. and more.

If shaft deflection or misalignment produces minimum clearances less than those indicated above, then the bearing proportions should be modified to produce less deflection, or the bearings should be lined up to correct misalignment, or if this is not feasible, the bearings should be mounted on spherical seats to permit of self-alignment.

LUBRICATION AND DISSIPATION OF FRICTIONAL HEAT—Surface pressures and speeds of a bearing are closely related to the lubrication and the



A CONSTANT level waste packed railway motor bearing of similar design to that shown in the illustration on the opposite page

method of heat dissipation. They also depend upon the materials for shaft and bearings and their surface finish.

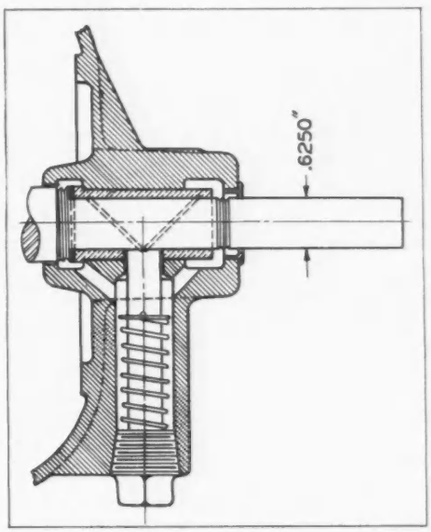
There has been a decided tendency lately to increase the maximum bearing pressures from 40 to 80 lbs. per sq. in., which have been the prevailing pressures for electrical apparatus, to 150 lbs. per sq. in. and over. This is due to better knowledge of lubricating problems, better bearing design and improved materials and manufacturing methods.

According to M. Guynes (Electric Railway Journal of Jan. 16, 1926), the pressures on some locomotive motors are as high as 500 lbs. per sq. in. when starting a train and 185 lbs. per sq. in. at the continuous rating of the motor, but on motors for single-unit or multiple-unit cars the pressures are kept materially lower.

High speed bearings require a careful analysis of the ability of the unit to dissipate the frictional heat generated. The following factors, according to Prof. Kingsbury, enter into the dissipation of bearing heat:—

1. Heat absorbed by the circulating oil (provided oil circulation is used).
2. Heat absorbed by cooling water (provided water cooling is available).
3. Heat disposed of by radiation and convection.
4. Heat stored in the oil bath.
5. Heat stored in the surrounding metal.
6. Heat conducted to the bearing parts, but generated elsewhere, such as electrical resistance, steam heated parts, and adjacent bearings.

The first three factors can be readily determined or approximated. Factors 4 and 5 are of minor importance as



UNIVERSAL motor, ¾ hp., 4200 rpm., with single wick oiler. Oil return passages are provided. The tops of the oilers are below the shaft level to avoid flooding. This type of bearing is for horizontal operation only

soon as temperature balance is reached and factor 6 can be estimated.

With these factors determined or approximated, it will be possible to decide whether the bearing will operate without excessive heating with or without additional cooling means (oil circulation or water cooling, or both).

The running clearances of the bearing should be determined with due regard to necessary thickness of the oil film, shaft deflection and misalignment, so as to prevent metallic contact under all circumstances excepting when at rest.

The clearance should also be checked for thermal expansion due to the maximum possible temperature rise. There should be no possible chance of seizing owing to expansion with insufficient clearances.

The method of applying the lubricant to the bearing surfaces is of vital importance to satisfactory performance of bearings. In connection with plain bearings, grease lubrication for electrical machinery is confined principally to small motors (portable tools), preferably in conjunction with wicks located in suitable recesses.

There are two general methods of introducing oil to bearings—

1. LIMITED FEED LUBRICATION.—The gravity drop oiler and the mechanical drop feed lubricator are used very little on modern electrical machinery. The wick feed or waste packed bearings on the other hand are used very extensively in modern electrical practice. In smaller motor sizes the simple wick and waste feed is used very successfully, while waste packed bearings of somewhat more elaborate design are the type preferred for railway motors.

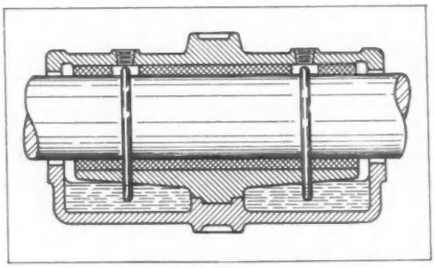
The chamber containing the waste must be of ample size and accessible to permit packing. An oil chamber is connected to the waste chamber. A settling chamber for dirt, below the bottom of the oil chamber, is very desirable.

THE capillary action of the wool lifts the oil from the oil chamber, thereby feeding it at a uniform rate to the bearing through an opening in the waste chamber. The size of the capillary tubes of the wool and viscosity of the oil determine the rate of oil feed. In order to exclude dirt, the wick should be large enough to cover the opening in the bearing.

2. FLOOD LUBRICATION.—This method of lubrication can be sub-divided into low pressure (gravity) and high pressure flood lubrication.

3. LOW PRESSURE LUBRICATION.—The so-called splash lubrication belonging to this group is not applicable to armature bearings. Oil circulation by means of separate pumps and feed to the bearing through gravity is rarely used in connection with electrical machinery. Of great importance, however, is flood lubrication, oil rings and chains, and to a lesser extent the lubrication by means of collars attached to the shaft.

Ring or chain oilers lift the oil continually from an oil reservoir to the top of the shaft, whence it flows to the remaining bearing surfaces and returns to the reservoir. For proper operation of these bearings, the oil chamber must be of ample capacity to cool the oil and must also have a settling chamber to accumulate dirt without stirring it up. Oil rings and chains are not suitable for very high speeds, since then there is excessive churning which causes overflow. Oil collars fastened to the shafts provided with wipers which lead the oil to the bearing, are more satisfactory—for high speeds. They are also more positive in operation than ring and chain oilers at lower speeds and less likely to stop pumping oil



LARGE synchronous motor bearing complete with two oil rings. This bearing is of the split type

at low oil levels. However, the use of collar oilers increases the axial strength of the bearing by the width of the collar.

4. HIGH PRESSURE LUBRICATION.—This system of flood lubrication is particularly used for large high speed bearings such as turbo-generators, etc. Oil is fed at high pressure to the loaded side of the bearing, thereby preventing metallic contact and wear when starting. The oil which is always pumped in ample quantities, carries away the generated heat and any impurities due to wear. The oil is cooled and filtered before being returned to the bearing.

One of the most important factors for satisfactory performance of plain bearings, whether intermittently or continually lubricated, is the location of the lubricant inlet. In order to get the lubricant between shaft and bearing so as to be available for the formation of the oil film, the lubricant must be admitted at or near the point where the oil film pressure is a minimum.

The question of oil grooves has been the subject of considerable controversy. The function of oil grooves is to distribute the lubricant over a sufficient portion of the length of the bearing and to collect the oil before it is forced out at the ends of the bearing so as to permit of returning it to a reservoir for redistribution to the bearing.

Oil grooves, at the points of maximum film pressure, are detrimental, since they tend to cause breakdown of the oil film and also reduce the active bearing surface.

Bearings with forced feed lubrication require practically no grooving excepting longitudinal grooves in the neutral zones and circular grooves for the lubricant return. Oil grooves should be free from sharp corners which tend to scrape the oil from the shaft surface to which it adheres, which adhesion is essential to the formation of the oil wedge.

Given properly designed and manufactured bearings, their satisfactory performance and life will depend very materially upon the exclusion of abrasive matter and the retention and circulation of uncontaminated lubricant of appropriately low temperature.

In electrical machinery, oil leakage has the additional detrimental feature of soaking the insulation, which is cause of one of the most serious troubles with electrical machinery.

THE oil retention in plain bearings for electrical machinery is perhaps more important than the complete exclusion of dirt, which is very essential with anti-friction bearings. The overflow or leakage of oil into the windings may be due to an excessive amount of lubricant, with resultant formation of oil spray which readily penetrates into the motor, particularly if there is windage through the bearings.

The installation of suitable oil overflows preventing an excess amount of lubricant in the bearing chamber, as well as the application of oil throwers, baffles, felt washers or labyrinth seals, are available as remedies against oil leakage as well as against entrance of dirt. At the same time the lubricant requires much less frequent renewal. The slight additional cost for bearing seals is, therefore, well warranted because of increased operating safety and reduced maintenance and repair costs.

The satisfactory performance of bearings is closely bound up with designs which permit of accurate manufacturing, as well as of easy assembling and dismounting. Solid bearings as a general rule are preferable to split bearings. While split bearings are adjustable for wear, they are far less rugged and also more expensive to hold to close limits. Furthermore, adjustable bearings are required only for very heavy bearing pressures, for reciprocating loads and for precision spindles.

In general the same considerations as for cylindrical bearings apply to the design of thrust bearings. There is a pronounced difference regarding the lubrication of solid thrust as compared with cylindrical bearings. Perfect film lubrication of thrust bearings is practically impossible excepting in the case of hydraulically supported step bearings with pressure oil feed and pivoted segmental bearings. The allowable surface pressures in lbs. per square inch are therefor much less than with cylindrical bearings.

Thinking It Out
With the Editor

Maintain Wages, Yes, But—

THERE is much editorializing in the daily press these days about keeping up wages during the let-up in business. The point generally made is that present-day far-seeing employers observe that "prosperity and high standards of living in this country are largely the result of good wages." Hence the conclusion is that if you just simply pay high wages prosperity results. But little is said of the ability on the part of the individual manufacturer to pay high wages and stay in business.

It is like saying to a man floundering in deep water, "Grab a life preserver and the chances are that you will be saved for a long life of usefulness," without at the same time throwing him the necessary life preserver or telling him how to go about getting one.

It remained for the New York *World* to go to the very core of the matter when it said editorially on Aug. 4, "But this is not the whole story. High wages proved conducive to greater industrial efficiency. It did not pay to use a high-priced worker with inferior equipment, and so improved machinery was installed and the factory organization overhauled in the interest of efficiency. Production costs were thereby reduced in spite of the high cost of labor, and with lower costs came lower prices. This explains why wages have been holding near their level of the war period while prices have been receding."

Here is the essence of the workability of the "new spirit"—"the new attitude toward labor"—on the part of executives. It is the life preserver in our figure of speech.

The new point of view toward wage rates, which we hear so much about nowadays, is in itself a happy thing but it is possible only with the most efficient of modern machinery, not simply machinery which still has in it years of productivity.

Too many manufacturers measure the life of their machines and equipment in terms of years alone rather than in the continuance of cost-cutting ability. Workable life of a machine is one thing—profit-making life, quite another.

Modernize your equipment and then maintaining of wages comes easy. That is the way of returning industrial activity.

Why Not a "Management Audit"?

A BENCH workman put a pertinent question. Fortunately it was addressed to an executive who was big enough to profit by it. Just $5,000 was saved the concern during the first year following the query put by this inquisitive workman.

He had asked why a certain part his concern manufactured was necessary. Couldn't it be eliminated, he wanted to know. Indeed, why not, echoed his superior and so on to the top of the organization. Tests proved that the workman was right, his reasoning sound.

Of course the situation should have been discovered months—perhaps years—before and you may reason that good management would have found this out before it was stumbled upon by a bench worker.

But two facts having large profit-making possibilities come out of the incident. One is that such money-making and dollars-saving suggestions lie under our very noses, and the other, that every single man in a manufacturing organization is a potential suggester of cost-cutting methods and plans. Good management will find ways of tapping these idea resources.

Perhaps it would be a good plan to have a check-up week periodically when everybody in the organization from office boy to president would focus upon cost-cutting plans. Out of a pool of ideas thus created some good would be sure to come.

The Positive Slant on Customer Relations

IN the sales department of the Wrigley gum organization nobody is authorized to turn down a customer's request without first having the matter come over the desk of no less a person than the vice-president in charge of sales. And of course there is lots of leeway to say yes without consulting that official.

The reasoning behind this policy is, why not do the thing that pleases the other fellow unless there is some perfectly obvious reason for not doing it. How much better than the blind following of hard-and-fast "yes" and "no" rules.

It amounts to taking a positive rather than a negative slant in relations with customers. No wonder this concern has excellent dealer relations—the best that there are.

Many an electrical manufacturer might take a lesson from this master merchandiser.

THE most primitive way of moving ton-miles is by carrying a pack on your back, and the cheapest way is carrying it by water over long distances in steamships. The Alaskan rate by man pack is 60 cents a pound for a distance of 30 miles over Chilcoot Pass. This is at the rate of $40 a ton-mile.

The steamer rate for carrying goods on a long journey is a half cent a ton-mile. Eight thousand times as much in one case as in the other.

A tremendous spread, yet in the average electrical factory are entirely too wide gaps between what might be and what is in the cost of handling materials from receiving room door to shipping platform. L. I. T.

A Motor Repair B

WENDELL SZABADOS, a motor repairman of Brooklyn, N. Y., has saved a great deal of time and money by the use of two motor repair benches that he constructed from old barber chairs

IT is not always easy to lift a motor frame up to the top of a bench of standard height, but this bench is flexible and can be lowered to a point where lifting motors to the top is made easy

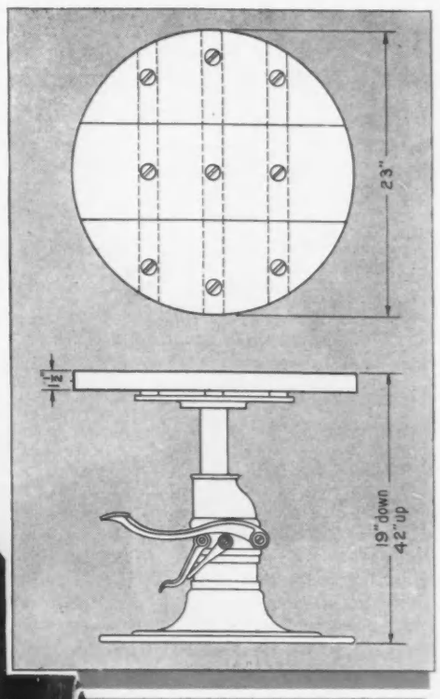
HAVING put the motor to be wound on the bench, it is a simple matter to pump it up to any desired height by the use of the foot-controlled hydraulic pump in the base of the bench

THE motor repair bench illustrated and described on this and the following page is not attached to the floor. It is light enough that it can easily be slid about on the floor by one man or moved to any location on a small truck

FOR putting in the lower coils of a stator, it is most convenient to have the bench high. It is simple. Just a few pumps of the foot on the long lever shown in front, and the stator is just where the winder wants it

Bench That Was A Barber Chair

A MOTOR repair bench made of a barber chair is a bench well constructed, because the mechanism of a barber chair is both sturdy and dependable. The chair used here was more than fifteen years old



CONSTRUCTIONAL details and dimensions of the barber chair bench. The bench is 19 in. high when collapsed and 42 in. high when extended. The top is made of three 1½-in. planks screwed to cross pieces underneath

NOT only can this bench be pumped up and down, but it can be turned about like a piano stool. The operator in this case (right) wants the bench stationary, so he is locking it against swiveling

STEP on one of the small levers, and the bench collapses slowly to any desired height. The extension consists of two plungers, one telescoped inside the other. Oil is used in the hydraulic pump

MR. SZABADOS states that the hydraulic pump in the barber chair used for making the bench described here has remained so tight for years that he can put a heavy motor on the bench at night and the motor will not have lowered more than a fraction of an inch in the morning

Automatic Light

By J. V. BREISKY
Supply Engineering Dept.
Westinghouse Elec. & Mfg. Co.

ADEQUATE illumination is a problem to which every home-owner, shopkeeper, school superintendent, and factory manager gives much attention. The relationship between good eyesight and good health, between clear vision and efficiency cannot be overlooked.

A person might as well wear dark glasses as to work in a half light, and there are times on gloomy days, perhaps early in the morning or toward dusk, when the normal amount of daylight fails so gradually as not to make a definite impression on whomever is responsible for providing artificial light. Sometimes even at noon, daylight goes down to a very low value. At such times, when there is neither bright daylight or actual gloom, the question of adequate lighting is particularly troublesome. The purpose of this article is to describe a new automatic device which provides for artificial illumination whenever it is needed in order that the amount of light should never fall below a fixed minimum.

Psychology tells us that human judgment is liable to serious error in judging degrees of heat, odor, or illumination. Every young mother learns that the temperature of a baby's bath is to be measured by the use of a thermometer and not by her hand. One of the simplest experiments in elementary physics teaches the student how relative is his ability to judge temperatures. Water which felt warm when the hand was "unprejudiced" feels cold after the hand has been immersed in hot water.

Similarly with eyesight. How often is someone heard in a home saying: "Do come away from the window and light the lamp. You'll ruin your eyes in that light." The fall of dusk is so gradual that the reader often observes no change until it is almost dark.

Even where many pairs of eyes are involved, it is left more or less to chance whether lighting is at all times adequate. Sometimes artificial lights are operated unnecessarily after they have once been put on, thus causing needless expense. More often work is done for considerable periods of time in a half light before the need for supplementary lighting is realized. The loss in effective production under these variable conditions of illumination is difficult to estimate.

As in the case of many other problems in the present-day industrial world, a mechanical device has been perfected as a substitute for inaccurate and capricious human perception. It is now possible to maintain an unvarying minimum degree of light in an office, schoolroom, or factory. When the day is dull and natural light becomes insufficient early in the afternoon, artificial lights are automatically switched on. If the sun comes out again this watchful device causes indoor lights to be extinguished. All that human judgment has to determine is at the outset: how much light is needed for maximum efficiency. The "photo-electric lighting control unit" will do the rest. In problems, then, where mere visibility is involved, a mechanical device is a perfect solution. Automatic control of lights will eliminate another worry for the factory manager who does not wish to waste money in extravagant burning of lights, nor efficiency in impairing the vision of his workmen.

This new device for increasing industrial efficiency is

another application of the famed photo-electric cell, popularly called the electric eye. This clever little cell, which somewhat resembles a radio tube in appearance, is a most unpretentious looking piece of apparatus, and is as modest in cost as it is in appearance. Since the tube is sensitive to light, when a voltage is applied across it the current through the tube will change in proportion to the intensity of light falling on it. The current through the photo-electric cell being extremely small, it is amplified through a grid glow tube, the current through which is large enough to operate a relay.

BY the use of a relay embodying a photo-electric cell which is highly sensitive to variations of light, it is possible and practicable to control all kinds of lighting installations, so that as the intensity of illumination falls to a certain point the lights are turned on automatically

Briefly, the "photo-electric lighting control unit" consists of a photo-electric cell, grid glow tube, a step-up transformer, relay, condenser, a pilot lamp, and two resistors mounted on a metal base. The unit is inclosed in a sheet steel cover which screws down to the base.

The cover has a glass window through which light reaches the photo-electric cell, this window being made in the shape of a cone so that dirt and foreign matter will not collect on it readily and keep light from the cell. The unit is so constructed as to receive light from all directions.

The lighting control unit should be located where the light it receives is representative of the light reaching the working plane of the room in which the artificial lights are to be controlled. The unit can be exposed to both the natural and the artificial illuminations, since, by means of the pilot lamp, the effect of the artificial illumination on the unit is compensated for. Provisions are also made to prevent the artificial lights from being turned on and off by very small fluctuations in natural illumination.

Adjustments are provided for setting the unit for any desirable turn-on and turn-off value of natural light. For instance, a typical cycle of operation would be as follows:

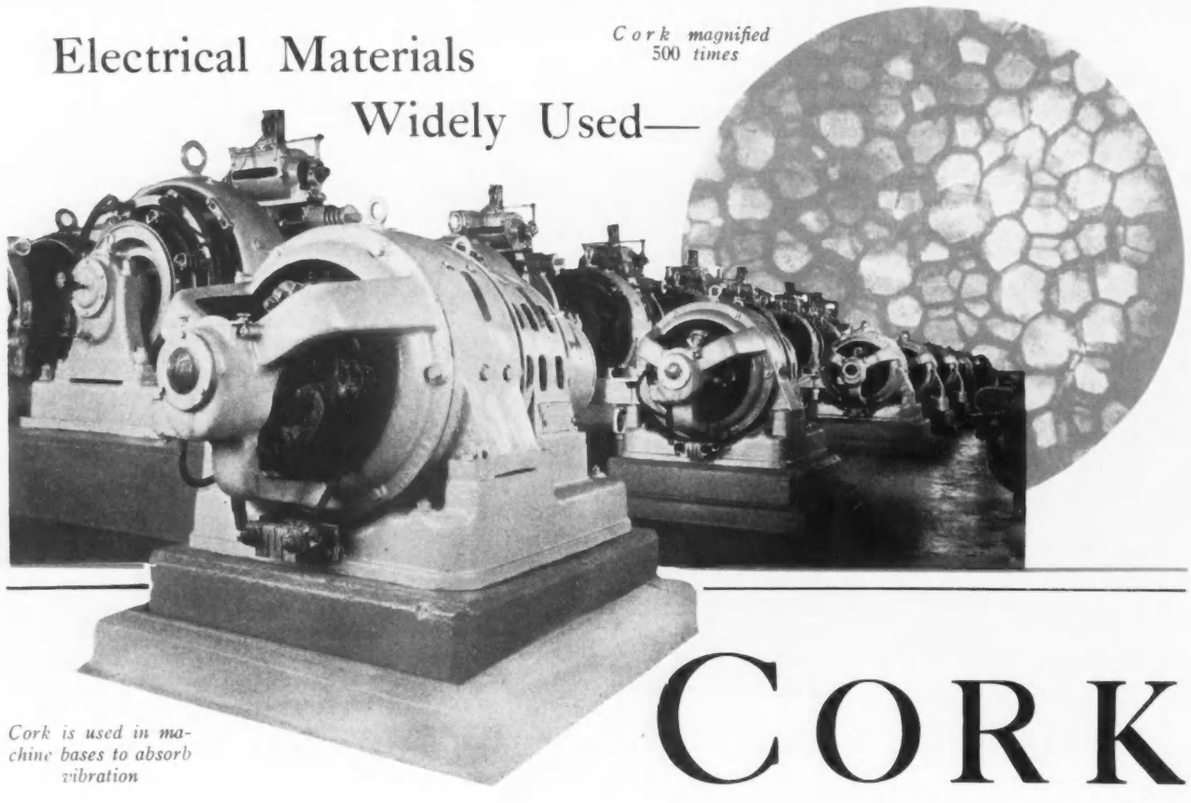
For an example assume that the artificial lights that are to be controlled have an intensity of 10 ft. candles, that they are to be turned on when the natural illumination falls to 10 ft. candles and that they are to be turned off when the natural illumination rises to 20 ft. candles. In the middle of the day the natural illumination will be greatly in excess of 10 ft. candles and the artificial lights will be off. When this condition exists, the photo-electric cell passes a relatively large current, the grid glow tube will be dark, and the relay de-energized. Later in the day when the natural illumination falls to 10 ft. candles, the photo-electric cell passes a smaller current, the grid glow tube will glow and the relay will operate. This action closes the contacts which turn on the artificial lights. The glow tube will continue to glow and the artificial lights will remain on until the natural illumination increases to a value of 20 ft. candles. When this occurs, the photo cell will cause the glow tube to stop glowing, and the relay will drop out, turning off the artificial lights. The unit is now in the condition originally described.

The lighting control unit operates from a standard 110 volt, 25 to 60 cycle circuit, making the installation very simple. It requires very little maintenance, since the unit is simple in construction and the tubes used have long life and constancy.

Not only for problems of indoor lighting, but outdoors as well, an automatic lighting control can be adapted to solve illumination problems. Street lighting, for example, is generally adjusted according to a fixed time schedule, which is often unsatisfactory when weather conditions vary. The advantage of automatic control to provide adequate illumination can readily be perceived.

THE photo-electric cell control unit consists of a photo-electric cell, a grid glow tube, a step-up transformer, a relay, a condenser, a pilot lamp and two resistors mounted on a metal base. The unit is placed where lighting is representative of all the lighting to be controlled

Electrical Materials Widely Used—



Cork magnified 500 times

Cork is used in machine bases to absorb vibration

CORK

By WILLIAM CRAWFORD HIRSCH

CORK possesses a number of properties which have built up for this product of Nature as well as for its fabricated derivatives a wide and steadily growing range of utilization in the electrical industry. Its cellular structure, more than half of the volume of ordinary cork being made up of the air within the cells, is more than any other of cork's characteristics responsible for its industrially valuable properties. First among the latter is resistance to the penetration of liquids, an advantage which many centuries ago led to the use of cork in the form of bottle stoppers.

It is because the structure of cork is cellular and not fibrous that there is no capillary action and ensuing escape of liquids. In a number of electrical uses of cork this characteristic of a seal against the passage of liquids is of paramount importance, as, for instance, in gaskets used in circuit breakers in connection with oil-filled equipment.

Affecting solely the air within the cells, compression causes no material amount of permanent deformation nor lateral spreading, the compressibility of cork, therefore, making it an ideal material for protective sealing, not only to prevent leakage of liquids, such as oil, but also to exclude moisture, dirt, and other foreign matter. In gaskets for hand-holes and cover plates of transformers, fine cork composition is generally used for that very reason. Its resilience, making for absorption of vibration, gives cork an important place in machinery isolation, such as in turbo-generators, motor-generator sets, transformers, etc. Pressure, no matter how long continued, does not affect its resilience. When the load is removed, the cork returns immediately to its natural springiness. This same property enables cork, in the form of gaskets, to fill the irregularities in the surfaces between which it is forming a seal.

Cork's high coefficient of friction is another of its outstanding virtues. It is used because of its frictional sturdiness in feed-rolls of machines handling paper, cloth, etc., and in certain forms of power transmission and types of clutches. To its frictional quality cork is indebted for its use in the form of rolls in the selector mechanism of automatic dial-telephone switchboard equipment. Cork is used as a friction drive in floor waxing and polishing machines.

Another characteristic of cork is its buoyancy, the natural product having a specific gravity of from 0.15 to 0.20, making it one of the lightest of solid substances. This, together with its resistance to the penetration of liquids, makes it a suitable material for floats, in various devices.

The cellular structure of cork provides an effective barrier to the passage of heat. It is this low thermal conductivity or heat insulation that makes cork a highly suitable material for handles of vessels and other appliances that are heated. Cork ignites only in direct contact with a flame and burns only so long as the flame is applied from without. At 250 deg. Fahr., exceedingly slow charring begins and this is not immediately destructive. In fact, combustion produces a carbonized coating which retards further burning.

Cork is the outer layer of the bark of the cork oak which grows in some of the countries bordering the Mediterranean Sea, notably so in Spain and Portugal. Algeria, Tunisia and Morocco, as well as southern France, including Corsica, and parts of Italy also contribute to the supply. The cork oak attains a height of from 20 to 60 feet and a maximum diameter of about four feet. In the spring yellow flowers appear on the branches, and these are followed by acorns which, when they fall in their ripeness, are utilized as food for swine.

When the tree's outer bark has attained the governmentally regulated thickness after about twenty years of growth, the virgin cork, rough, coarse, and dense in texture, is stripped away, and this procedure starts the tree on its productive life, the virgin cork being commercially of little value. A covering of finer texture sets in, each year adding two layers of cells, one within, increasing the diameter of

the trunk, the other without, adding thickness to the sheathing of the bark. After eight or ten years the new outer bark is removed.

While an improvement on the first or virgin bark, the first subsequent stripping is still far from the quality which the tree yields at the third and subsequent strippings, each of these about nine years apart. When about two score years old, the cork oak begins to yield worthwhile bark. The trees produce for about a hundred years, some attaining the ripe old age of several centuries without their bark diminishing in quality.

The operation of stripping the ½ to 2½ in. thick bark can be entrusted to none but the most competent hands because injury to the tree's inner skin means a heavy and permanent loss. The Spaniards use a long-handled hatchet, wedge-shaped at the end. In Algeria, crescent-shaped saws are sometimes used. The yield per tree ranges from 45 to 500 pounds.

CORK is used in electrical machinery to prevent leakage of liquids, to exclude dirt and moisture, to absorb vibration, and for friction drives and other uses requiring a material with a high coefficient of friction. Its cellular structure also provides an effective barrier to the passage of heat, making it suitable for handles.

After the bark has been dried for a few days, it goes to the boiling station where it undergoes further seasoning. A boiling process removes the tough and useless outer coating, causing a shrinkage in the weight of the yield of about 20 per cent. The tannic acid content is eliminated in the boiling process which leaves the cork soft and pliable as well as flat for convenient packing. Grading and baling follow.

The leading cork manufacturer recognizes 80 distinct grades of primary material.

A good deal of the cork produced in the Iberian peninsula is fabricated there, Catalonia being an important cork-manufacturing province. The utilization of cork in engineering products lends itself, however, more to the temperament and manufacturing as well as promotional skill of industrial nations, such as our own, and the domestic cork products industry has been developed along the lines of the other triumphs of American mechanical ingenuity and the closest laboratory control of all processes.

The raw cork is subjected to further sorting when it arrives here; softened by vaporization; sliced by rapidly revolving saws; shaped by blocking and tapering machines; washed and dried by the latest mechanical devices; and transformed into a myriad of finished parts and products by all sorts of automatic machinery calling for the highest degree of engineering talent and huge capital investments.

The leading American cork interest not only operates 23 cork assembling stations in Spain, Portugal, France, Algeria, Tunisia and Morocco, and nine cork preparation plants in those countries, but also six manufacturing plants in Spain in addition to the ten operated in the United States.

Our imports of unmanufactured cork last year aggregated 75,919,151 pounds, valued at $2,789,159, but in the previous year they exceeded 100,000,000 pounds and $3,000,000 in value. It is highly significant that last year's imports of what is officially classified as "cork waste, shavings and refuse," reached a total of 180,971,007 pounds, valued at $4,444,192, nearly two and a half times the tonnage of bark imported and having a value two-thirds greater than the latter.

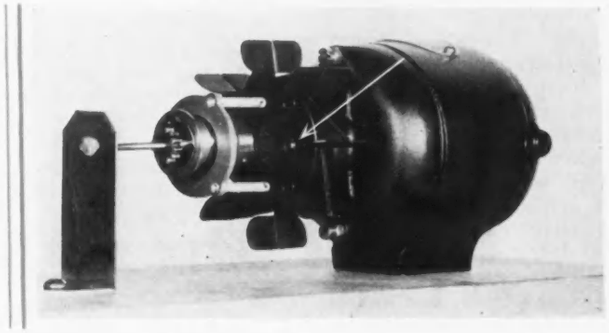
This emphasizes the steadily growing importance of cork compositions. By grinding cork into small particles and then reuniting them by various binders, a closely controlled product is obtained that loses none of the virtues of the primary material and is not subject to Nature's variations as is the bark itself. Composition products are not only available in the form of sheets, discs, tubes, blocks, rings, strips, rods, balls and wheels, but when necessary can be molded to the desired pattern.

Combined with cloth or vulcanized fiber through lamination, cork sheets of superior tensile strength are obtained. Obviously in the fabrication of parts from cork bark, cuttings, shavings and other forms of scrap remnants result. To speak of these as waste is a misnomer, however, because none of this material is permitted to go to waste, the cork manufacturing industry being one of those in which conservation and utilization of by-products has been brought to the highest possible degree of perfection.

In addition to the descriptions of cork imports previously mentioned, last year's arrivals embraced 61,198,268 pounds of cork insulation, valued at $3,217,338; 580,196 pounds of cork discs, wafers or washers, valued at $458,802; and 55,770 granulated or ground cork, valued at $2,230, as well as 11,270 pounds of cork bark, cut into squares, cubes or quarters, valued at $4,073. These imports are aside from those of cork stoppers which last year aggregated 433,087 pounds.

A good deal of cork finds its way into domestic appliances. Cork gaskets are used to absorb vibration under the legs of motors in electrical refrigerators. Cork packing protects the holes around cabinet pipes. Soft copper coils are held securely in place by cork. Cork washers are used in bolting provision chambers together. Cork pads are used between the base and the compressor of refrigerators. While the latter are in transit, tapered corks placed at the end of coil tubing exclude dust and dirt. Gear stuffing boxes of electrical ironers are packed with cork. Cork serves as a friction drive in floor waxing and polishing machines. Tapered corks are used to protect the ends of electrical percolator spouts while in transit.

HAVING a high coefficient of friction, cork is suitable for use in friction clutches used on electrical machines. The arrow shows the inside of a friction clutch used on an Eastman kodascope



The control rooms of radio broadcasting stations have cork tile floors and a good deal of the control apparatus contains cork in the form of gaskets and other shapes. In radio receivers, cork pads are frequently used under cabinets, the latter being also protected by cork pads during shipment. Cork clutches are used in connection with a coil-winding device and cork rings in testing cone speakers for their sound qualities. In the sound boxes of some phonographs cork serves to improve tone qualities, while cork washers are used as pads under phonograph turntables.

Cork tapers, dipped in a flux solution, are used to wipe spots to be soldered on the bases of incandescent lamps. Carbonized granulated cork imparts a smooth finish to

(*Continued on page* 82)

Industrial Control

(*Continued from page 57*)

little care and effort. Some of the things to be remembered in this connection are:

(a) Push button or master switch operation of magnetic controllers insures a minimum distraction and responsibility of the operator and a maximum production economy.

(b) A control equipment composed of several segregated parts often permits the manually manipulated parts to be most conveniently located for operation.

(c) The frequency of manipulation and the force required to move the controller arm will determine if a manually operated device will answer the purpose.

(d) The direction of movement of the controller handle should be considered, particularly on cranes, elevators and hoists.

(e) Control from more than one station, as for large printing presses, conveyors, etc.

Having then determined what our controller has to do and what characteristics and features it must possess, let us turn to the various types available, which, as has been said, offer many combinations, and see what we can find.

One way of broadly subdividing industrial controllers is by the construction of the switching devices. The present-day types fall chiefly into three classes, namely:

1. Face Plate, including dial and knife or snap switch types.
2. Drum types, including cam operated finger types.
3. Magnetic types.

The first class covers chiefly general purpose starting devices and certain lines of dial controllers on which the duty is not particularly severe. They are available with adequate protective features and safety enclosures.

DRUM controllers in the industrial field are well adapted to manual operation for heavy service, such as cranes, hoists, and machine tools. Before the advent of magnetic control, drum controllers were used quite generally and successfully for severe service on large size motors to which it is now quite common to apply magnetic control.

The nature of the service tells whether our controller shall be a manual type, a semi-automatic, or a full-automatic type. By manual type we mean one requiring hand operation, and by semi-automatic type, one that requires at least the initial operation be personally directed by pressing a button or some other means. By full-automatic is meant a combination such as a pressure governor and magnetic starter that without attention will start and stop to maintain within limits the pressure in a water supply system. A magnetic controller, therefore, may be manually operated by means of a master switch that serves to energize magnetic contactors.

We may be interested in the accelerating method employed in a magnetic starter where the acceleration is automatic. We may find that time element is best suited to our purpose; or perhaps a current limit scheme, one responding to the increasing voltage on the motor armature or the decreasing drop across the starting resistance, is preferable. The availability of dependable timing devices has made time acceleration the method most generally employed.

When it comes to the kind of current reduction in starting motors larger than those that can be thrown directly on the line, we will take it for granted that a resistor of some sort is the thing to use in connection with D.C. motors, and with single phase and slip ring multi-phase motors. The squirrel cage induction motor, however, may, if the power rules permit, be thrown directly on the line in large sizes, and where some method of current reduction is required, we may find reason to consider the relative advantages of a resistance starter as compared with an auto-transformer starter. The latter, or commonly called "compensator" has the advantage of putting into the motor more current than it takes from the line, and so far has proved to be the popular device for starting squirrel-cage motors where the starting current is limited.

Controllers of both open and enclosed types are available, and the former are rapidly going out in favor of the latter. The manual types have external operating handles, and the cases of both types can be locked shut.

SOME controllers will be found to be oil immersed, a feature that is of advantage for three reasons, i.e., to afford good insulation between closely assembled switching parts of opposite polarity; to safeguard the switching mechanism against corrosion; and to prevent arcing of the switch parts from reaching the outside atmosphere where explosive gases may be present. Oil immersion, contrary to the general impression, is not of any advantage as regards the life of the submerged making and braking contacts. The same contacts in air with an adequate magnetic blowout will last ten times as long as they will when under oil and with the same breaking distance. Controllers subject to frequent service should not have oil immersed switches as the oil will rapidly carbonize and become a menace.

As accessories to controllers, especially the magnetic types, we will find available push button stations, master controllers, float switches, pressure and vacuum governors, thermostats, limit switches, etc., which will permit us to effect practically any combination as desired for the control of the motor.

Much of the increased usefulness of the electric drive in its application to machinery performing more or less complicated evolutions has been made possible by the remarkable developments in the art of magnetic control. Improvements in magnetic contactors, prolonging the life of the contacts and the wear of the device as a whole, have permitted frequent duty cycles of starting, stopping and reversing, so that now we see motors direct connected to reversing planers, slotters and similar machines and put through their paces, as demanded by such service, easily and safely by an automatic magnetic control that functions incessantly with little attention.

Magnetic control provides for remote operation from push button stations, or other forms of master switches, from one or any number of points. The value of this arrangement in connection with the operation of machinery such as printing presses, conveyors, and automatic elevators, is obvious. It is possible not only to control the machine from any point, but also to lock it against operation from any other point.

MAGNETIC control is employed where automatic operation is required, as in the case of pump motors, which through the medium of a float switch or pressure governor are automatically started and stopped as the water level or pressure rises and falls. Automatic control of temperature can likewise be accomplished, utilizing a thermostat as the pilot control device. The advantages of magnetic control as compared to manual control can be summed up briefly under the following heads:

(1) Ease and convenience of operation. It is obvious that an operator can more easily manipulate push button stations, or a small master switch, than he can the lever of a large manual controller, and, furthermore, it is possible to place the small master device more convenient to the operator's position than is very often the case with a large manual controller.

(2) Magnetic control provides for automatic acceleration either by time element, current limit, or some other method,

(*Concluded on page 82*)

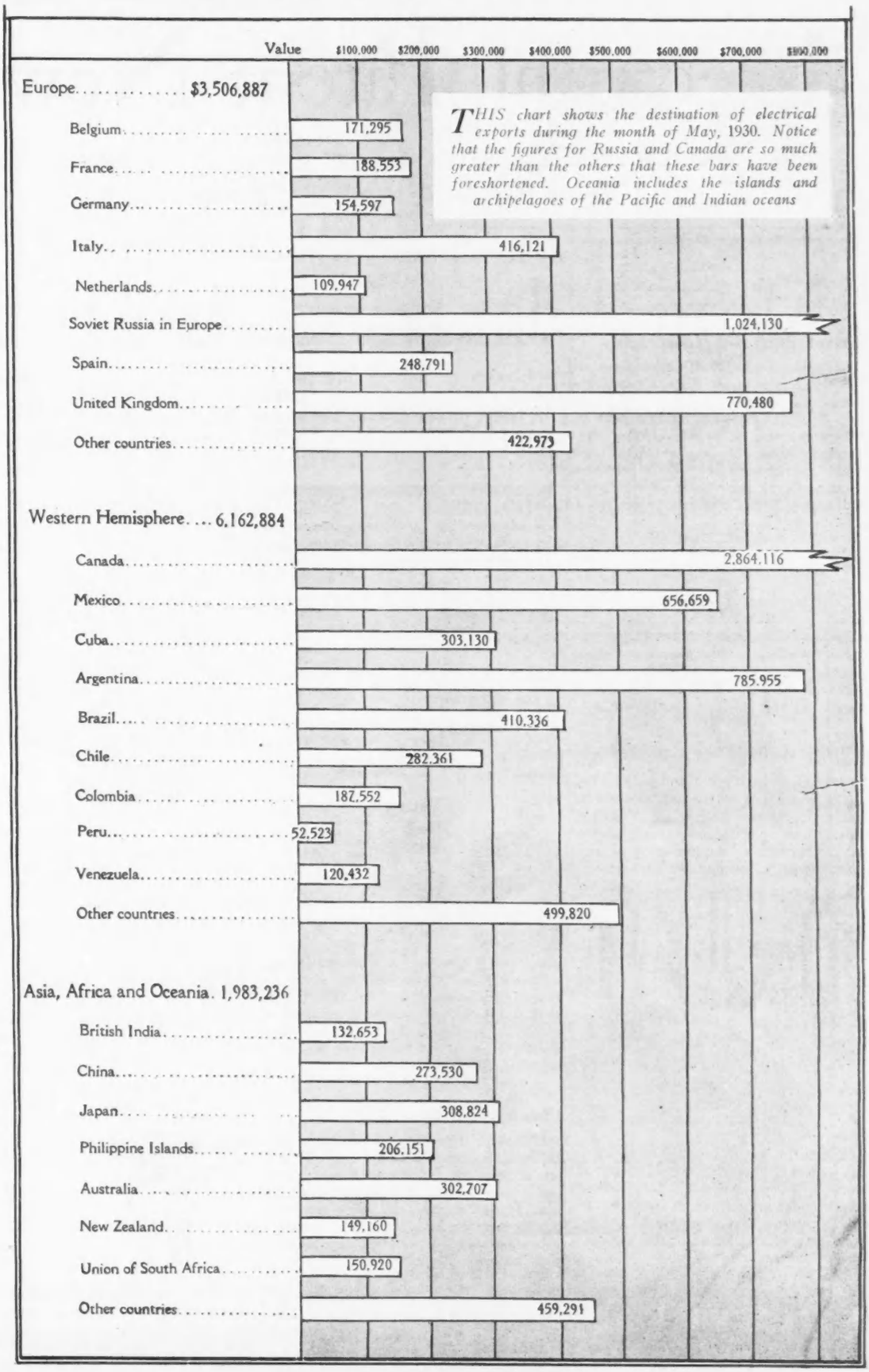
Facts, Figures and Trends

DEVOTED this month to statistics showing the present status of American foreign trade in electrical products, giving a comparison of the present situation with that of a year ago. These figures are published through the courtesy of the United States Department of Commerce.

Article	May		5 Mos. ending May 31	
	1929	1930	1929	1930
Generators:				
Direct Current—				
Under 500 kilowatts	$88,655	$98,341	$495,169	$404,760
500 kilowatts and over	15,860	2,155	197,206	317,079
Alternating current—				
Under 2,000 kilovolt amperes	21,116	68,798	98,823	192,648
2,000 kilovolt amperes and over	.....	39,500	.....	330,797
Steam turbine generator sets	108,551	31,797	445,286	609,203
Accessories and parts for generators	67,185	62,554	345,619	348,354
Arc welding sets	.....	51,009	.....	176,459
Self-contained lighting outfits	106,748	37,201	538,414	414,193
Batteries:				
Storage batteries	283,336	.....	1,547,545	.....
6 volt storage batteries	.....	148,465	.....	724,305
Other storage batteries	.....	87,607	.....	521,513
No. 6 dry cell batteries	.....	87,331	.....	287,475
Flashlight batteries	249,131	350,284	1,611,207	1,573,506
Radio B and C batteries (dry)	95,401	55,652	479,818	283,651
Other dry and wet cell primary batteries	143,177	22,557	744,543	165,098
Transformers or converting apparatus:				
Power transformers, 500 kilovolt amperes and over	87,958	460,550	446,746	1,484,159
Distribution transformers, less than 500 kilovolt amperes	91,140	252,970	543,445	1,055,926
Instrument transformers	14,612	22,568	62,880	97,845
Other transformers	90,340	102,133	482,378	654,876
Complete battery chargers under 15 amperes	20,114	21,820	119,566	77,984
Rectifiers, double current and motor generators, dynamotors, synchronous, and other converters	143,704	87,564	472,723	643,407
Transmission and distribution apparatus:				
Switchboard panels, except telephone	58,131	146,193	570,274	900,017
Switches and circuit breakers over 10 amperes	136,074	288,814	827,405	1,308,285
Fuses	42,765	29,108	269,913	188,436
Watt-hour and other measuring meters	98,312	61,729	607,868	348,880
Electrical indicating instruments	41,205	100,993	262,328	420,404
Electrical recording instruments	17,474	49,896	120,056	234,300
Other electrical testing apparatus	76,287	73,720	448,533	375,896
Lightning arresters, choke coils, reactors, and other protective devices	56,776	73,265	448,834	375,097
Motors, starters and controllers:				
Motors, 1/3 horsepower and under	209,140	221,365	1,107,537	1,115,101
Motors, over 1/3 and under 1 horsepower	66,453	52,652	353,293	281,055
Stationary motors—				
1 to 200 horsepower	237,259	342,474	1,601,813	1,899,636
Over 200 horsepower	26,694	72,090	143,677	292,415
Railway motors	2,596	7,270	177,383	96,227
Electric locomotives—				
Railway	.....	.....	144,987	148,324
Mining and industrial	13,341	129,539	168,652	370,240
Station and warehouse electric motor trucks	6,542	20,021	77,947	138,956
Starting and controlling equipment—				
For industrial motors	162,812	172,549	837,535	757,010
For electric railway and vehicle motors	53,595	11,622	78,926	75,985
Portable electric tools	120,938	85,003	635,093	543,757
Accessories and parts for motors	265,351	249,630	1,412,110	1,288,541

Article	May		5 Mos. ending May 31	
	1929	1930	1929	1930
Refrigerators:				
Refrigeration sets up to ¼ ton capacity	1,017,674	.....	4,155,503	.....
Refrigeration sets over ¼ to 1 ton capacity	48,237	.....	900,119	.....
Electric household refrigerators	.....	1,090,048	.....	4,565,217
Electric commercial refrigerators up to 1 ton	.....	299,357	.....	1,073,704
Thermodynamic refrigerators	.....	200	.....	1,881
Electric appliances:				
Electric fans	98,534	147,631	501,474	580,380
Electromechanical health exercisers	.....	17,320	.....	66,915
Electric incandescent light bulbs—				
Metal filament	104,392	.....	568,782	.....
For automobiles, flashlights, and Christmas trees	.....	2,552	.....	62,370
Other metal filament bulbs	.....	10,328	.....	441,027
Other electric lamps	34,937	5,346	251,348	170,745
Flashlight cases	222,903	19,022	1,278,483	618,934
Searchlights and floodlights	40,065	16,019	269,725	194,858
Motor-driven household devices—				
Electric household washing machines	196,675	146,958	833,566	829,560
Electric vacuum cleaners	112,650	34,086	525,428	525,519
Other motor-driven devices, except tools	108,832	58,708	501,641	408,057
Electric flatirons	33,972	26,894	167,342	137,729
Electric cooking ranges	14,391	30,564	168,295	114,046
Other domestic heating and cooking devices	70,804	81,641	399,374	403,288
Industrial electric furnaces and ovens	29,203	111,419	200,874	428,577
Therapeutic and X-ray apparatus	140,866	136,627	823,277	759,649
Signal and Communication devices:				
Radio apparatus—				
Transmitting tubes, sets and parts	72,562	59,071	381,971	557,719
Receiving sets	485,032	725,960	2,476,005	3,312,100
Radio receiving tubes	128,413	233,144	682,440	1,022,355
Receiving-set components	248,105	221,400	1,176,065	1,156,688
Loudspeakers	187,287	121,774	751,432	649,878
Other receiving-set accessories, n.e.s.	144,972	85,468	647,702	460,672
Telegraph apparatus	86,252	81,999	350,877	392,790
Telephone apparatus—				
Telephone instruments	129,255	63,909	409,266	273,988
Telephone switchboards	245,492	61,918	618,028	545,361
Other telephone equipment	255,403	393,173	1,199,351	2,130,480
Bells, buzzers, annunciators, and alarms	27,362	32,065	150,106	153,128
Other electric apparatus:				
Spark plugs	163,544	122,457	1,059,670	908,823
Other starting, lighting, and ignition equipment	113,062	179,294	803,815	787,913
Insulating material	78,422	113,769	568,167	627,130
Metal conduit, outlet and switch boxes	99,068	104,135	582,544	623,193
Sockets, outlets, fuse blocks, and lighting switches	195,049	167,752	974,085	830,124
Electric interior lighting fixtures	217,971	166,993	1,179,273	943,194
Electric street lighting fixtures	48,536	34,533	276,907	205,724
Other wiring supplies and line material	114,359	122,564	542,559	644,432
Other electrical apparatus, n.e.s.	903,008	852,612	5,785,747	4,518,262
Rubber and friction tape	36,087	40,899	217,547	181,307
Globes and shades for lighting fixtures	69,616	53,206	328,550	272,570
Glass electric insulators	36,127	31,877	219,479	155,469
Electrical porcelain:				
For less than 6,600 volts	54,639	38,848	354,732	274,625
For 6,600 volts and over	65,666	73,704	431,965	487,841
Carbons and electrodes:				
Electrodes for electric furnaces	237,306	246,831	1,019,939	1,043,160
Other carbon products	71,080	74,667	414,808	300,762
Insulated iron or steel wire and cable	39,901	14,229	199,544	131,304
Copper, bare wire	393,095	215,043	1,637,424	1,574,569
Insulated copper wire and cable	468,618	.....	2,854,103	.....
Rubber covered wire	.....	65,966	.....	446,207
Weatherproof wire	.....	46,133	.....	112,227
Telephone cable	.....	35,428	.....	176,626
Other insulated copper wire	.....	258,677	.....	1,472,732
Totals	$11,008,197	$11,653,007	$58,764,864	$60,277,609

ACCORDING to recent announcements, American exports in general fell off nearly twenty per cent during the first five months of this year as compared with the first five months of last year. The figures published here, however, show that electrical exports remain about the same as a year ago, some products being higher and some lower than last year.



THIS chart shows the destination of electrical exports during the month of May, 1930. Notice that the figures for Russia and Canada are so much greater than the others that these bars have been foreshortened. Oceania includes the islands and archipelagoes of the Pacific and Indian oceans

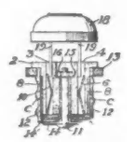
Electrical Patent News

Here are collected in condensed form a few of the outstanding recent patents of electrical devices

By Ray Belmont Whitman
Patent Attorney

Swivel Plug and Receptacle

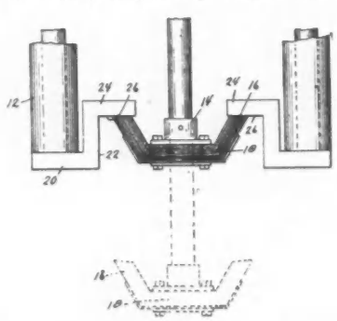
1,770,511. To Rolla B. Cunningham and Tunis J. Cunningham, Topeka, Kan., this patent was issued. It covers a swivel type of plug connection for electrical circuits comprising a rotable element as a receptacle positioned in a metal shell and rotable therein. It has fingers positioned on its periphery for contact with the metal shell and a sleeve engaging a pin at its



center for contact. The fingers and sleeve provide continuous connection between source of energy and the plug cap during rotation of the element.

Electric Switch

1,768,536. Issued to Chester D. Ainsworth, Wollaston, Mass., and assigned to Condit Electrical Mfg. Corp., Boston, Mass. This patent covers an electric switch having a depending stationary switch stud, a yielding switch member



movable mainly below the stationary switch stud, and a contact member carried as shown in the sketch. An intermediate current-conducting section is arranged to conduct current in a direction to oppose magnetically the yielding of the movable switch member.

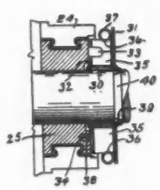
Arc Welding Electrode

1,770,799. This patent was issued to Paul O. Noble, Fort Wayne, Ind., and John A. Capp, Schenectady, who assigned it to the General Electric Co. The process of preparing an electrode for metallic arc welding, which comprises passing a wire of electrode material through a hot bath comprising a fused salt having arc-sustaining properties and adapted to be incorporated in the surface of the wire when treated in said bath.

Copies of any of the patents cited may be obtained by sending 15 cents to the Patent Editor, in care of Electrical Manufacturing, for each copy wanted.

Centrifugally Operated Contacts on Commutator Shaft

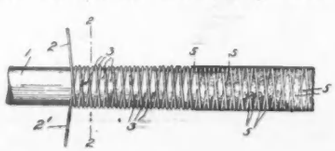
1,768,565. This patent obtained by John G. Campbell, Dayton, Ohio, and assigned to Frigidaire Corporation involves the combination with a motor rotor having a



shaft and a plurality of commutator segments, a plurality of conductor plates arranged transversely to the axis of the shaft. A series of contacts is arranged so as to tilt to engage the conductor plates, and there is a means for limiting the radial movement of the contacts.

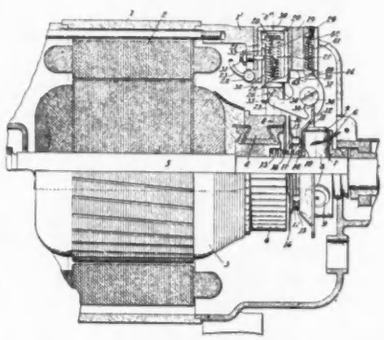
Flux Coated Electrode

1,768,998. This patent issued to Albert M. Ross, Jackson Heights, N. Y. It covers an electrode for arc welding comprising a core formed of a fusible metal, a sheathing of intermeshing wire surrounding the metallic core, and a flux composed of arc-sustaining material filling the interstices between the intermeshing wires.



Dynamo Electric Machine

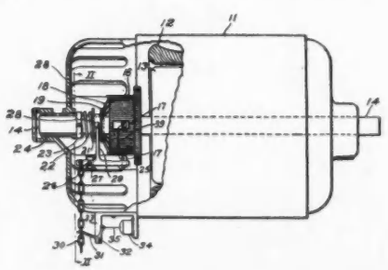
1,769,785. John D. Karle, Roselle Park, N. J., obtained this patent and assigned it to Diehl Manufacturing Co., Elizabeth, N. J. This involves in an electric motor an armature having a commutator, an armature shaft, speed-responsive commutator short-circuiting means including a disk movable lengthwise of the armature shaft, a brush yieldingly engaging the commutator, a brush-lifting lever having a notch entered by the rim of the disk, a spring



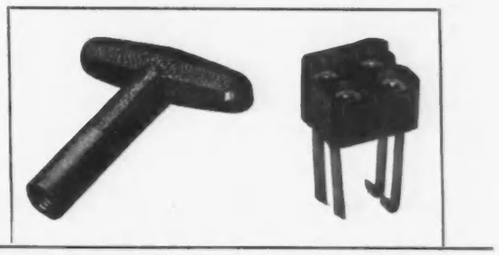
for moving the lever in a direction to lift the brush, and means independent of the disk for detaining the lever in one extreme position with full brush-lifting power stored in the spring.

Motor-Starting Means

1,768,896. To Ralph Ehrenfeld, Springfield, Mass., this patent was issued and assigned to the Westinghouse Electric &



Mfg. Co. In a repulsion-induction motor having a stator winding there are a control switch therefor, a rotor including a commutator cylinder, a commutator short-circuiting device, and a commutating means normally yieldingly held out of en-



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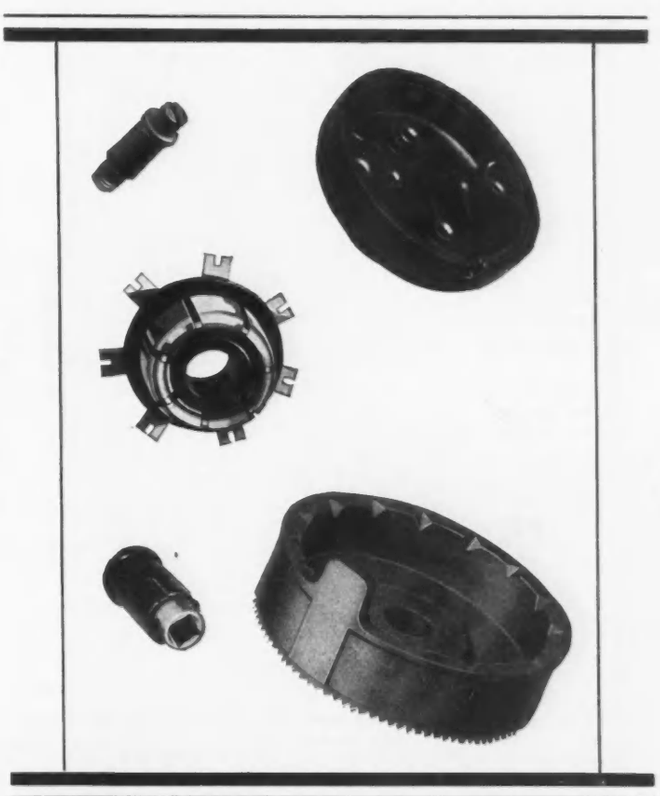

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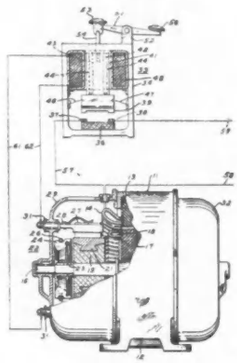
gagement with the commutator cylinder, means for effecting starting of the motor including a manually-operable means for simultaneously effecting closing of the control switch and engagement of the commutating means with the commutator cylinder.

Induction-Motor-Control System

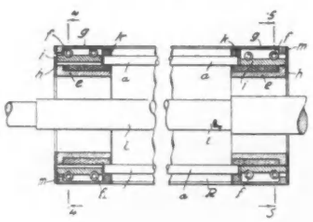
1,768,897. Issued to Harry D. Else, Springfield, Mass., and assigned to Westinghouse Electric & Mfg. Co. It covers a control system for a repulsion-induction motor having a stator-energizing winding,



a rotor, a rotor winding, a commutator cylinder and brushes, and a centrifugally-actuable commutator-short-circuiting device. The system includes an electromagnetic switch for the stator-energizing winding, means for connecting the coil of the switch to the brushes and manually actuable means for closing the switch.

Induction Motor

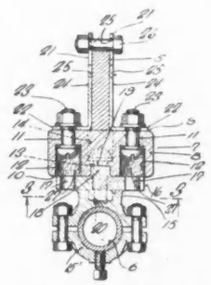
1,768,588. Issued to Emil Fassnacht, Landshut-on-the-Jsar, Germany, and assigned to the Firm Bayerische Elektricitats-Werke, Germany. In an induction motor this patent covers a rotor, a wind-



ing comprising rotor bars and short-circuiting rings having slots formed therein to constitute inductive resistances, and a magnetic system including iron cores extending through the slots in the short-circuiting rings, in combination with centrifugally operated means for varying the inductive resistances so formed.

Bus Support

1,769,891. Alwin G. Steinmayer, Milwaukee, Wis., obtained this patent and assigned it to Line Material Co., South Milwaukee, Wis. It comprises a base member, a flange on the base member having arcuate slots, and centrally disposed lug projected from the base member, an insulating member adapted to support a conductor and having a recess adapted to receive the lug, the insulating member



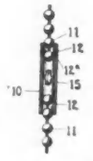
being adjustable about the lug, and securing means passed through the insulating member and the arcuate slots to adjustably secure them to the flange.

Spot Welding of Brass and Aluminum

1,770,540. Issued to Ernest Lunn, Chicago, and assigned to Pullman Car & Mfg. Corp., Chicago. The process of spot-welding together sheets of metal of low specific electrical resistance which consists in initially introducing a film of viscous liquid between the metal to be welded, applying pressure to the sheets of the welding area, and passing an electric current from one piece to the other at the point of application of pressure.

Insulating Link for Pull Chains

1,769,245. William C. Tregoning, Milwaukee, Wis., obtained this patent and assigned it to Cutler-Hammer, Inc., Mil-

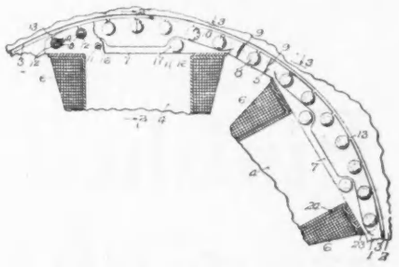


waukee. It covers an insulator for bead chains comprising a tubular insulating member which is slit longitudinally to permit expansion of the walls. There are internal projections adjacent to the ends of the tubular member, these projections having surfaces converging toward each other inwardly, and the projections have transverse shoulders to resist removal of the chain beads.

Method of Standardizing the Manufacture of Dynamo-Electric Machines

1,751,559. Theodor Schou, Mansfield, Ohio, assignor to the Ideal Electric & Manufacturing Company, Mansfield, Ohio, a Corporation of Ohio. 14 Claims.

The method of constructing a squirrel cage winding for a dynamo electric machine which consists in assembling ring segments in a series corresponding to the pole-pieces of a dynamo electric machine, securing the segments in parts to the opposite sides of the pole-pieces respectively in electrically effective relation to each other, and then driving conducting wedge members between and in electrical contact

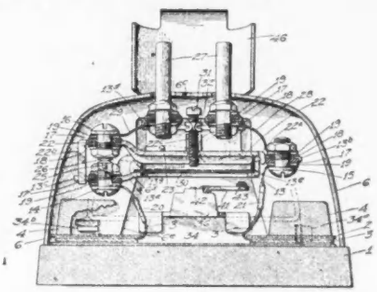


with adjacent ends of the segments to secure continuous electrical conductivity through the rings.

Electric Flatiron

1,751,124. Martin C. Bersted, San Diego, Cal. 5 Claims.

In a heating apparatus, a contact making and breaking means, including a sup-

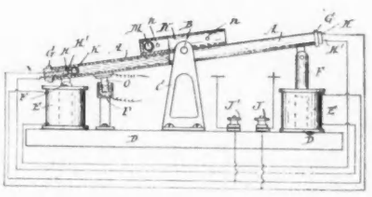


port, a single freely movable plate, capable of being distorted by heat, loosely mounted on and encircled by said support, an arm secured at one end, positioned contiguous to said plate, a screw mounted in said arm, adapted to be engaged by said plate, a contact member mounted in said support and another contact member mounted in said arm, adapted to engage said first mentioned contact member, and lever means secured to said adjusting screw or adjusting the latter.

Automatic Electric-Circuit-Controlling Device

1,749,775. Thomas Levice Minford Millar, Hamilton, New Zealand. 4 Claims.

An automatic electric circuit controlling device comprising a main tube piv-



oted at its middle to rock in a vertical plane, a solenoid disposed beneath said tube on each side of said pivot point and having a core operatively connected to said tube, contact means within each end of said tube adapted to connect the solenoid disposed on the other side of said pivot

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This raw material receives the same careful supervision by Mica experts in India as it receives later on in the United States, through the many processes of manufacturing.

Constant watching and frequent inspections are chiefly responsible for the reliable quality of Macallen Mica—and dependable quality is the foundation on which the business has steadily grown for 40 years.

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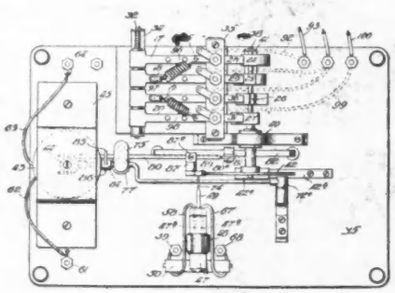
point therefrom in circuit with a source of electrical energy, a metallic ball movable in said tube and adapted to close the circuit of the contact means at each end of said tube when such end is lowered, means in said tube for restraining the movement of said ball, said means being adapted to be varied to vary the time of travel of said ball through said tube and a movable weight mounted on said tube and capable of movement across said pivot point as each end of said tube is lowered but adapted to be restrained on one side thereof, whereby the end of said tube on the same side of said pivot point as said weight is caused to drop back to its lowest position immediately after it has begun to rise.

Electric-Circuit Controlling and Timing Device

1,749,404. Harry C. Wanner and Leroy H. Moss, Chicago, Ill.; said Moss assignor to said Wanner. 18 Claims.

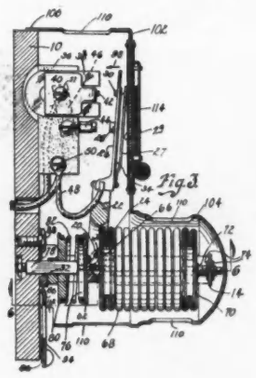
1. In a device of the character described, the combination of a solenoid having a reciprocable core, a mercury switch mounted on a tiltable support and connected to a source of electric energy through said solenoid, a lever having one end rotatably supported and the other end engaging said solenoid core for movement therewith and being also connected to said switch support to tilt said switch to energize and de-energize said solenoid and reciprocate said core, a rotatable contact actuating member, a driven wheel carried by said member, and a drive element connected to said lever and engaging said wheel for imparting motion to said contact actuating member.



Temperature Control Switch Structure

1,749,392. Albert Penn, Des Moines, Iowa, assignor to Penn Electric Switch Co., Des Moines, Iowa, a Corporation of Iowa. 12 Claims.

1. A structure of the character disclosed comprising a stationary contact, a yoke, a movable armature pivoted thereto, a contact carried by said armature and adapted to engage the stationary contact when the armature is in one position of its movement, a magnet, said armature being in close proximity to said magnet when in such position whereby a snap action switch is provided, a bellows having one end anchored to said yoke and its other end acting upon said armature for moving it in one direction and a spring opposing the action of said bellows.



Contact Points

(*Continued from page* 41)

are naturally in the name of the Fansteel Products Company, Inc., they being pioneers in this field.

It has been the Fansteel policy—and probably the policy of most of the other leading contact point makers—to obtain licenses under all pertinent patents not owned by themselves, which coverage, of course, is extended to users.

For still further protection, designs submitted by contact point users, or worked out in collaboration between the users and the contact point makers' engineers, are carefully investigated, and if existing patents are found covering such designs, proper steps are taken for full legal protection.

There are occasional requirements where mechanical pressure is not sufficiently great to permit the use of tungsten contact points. Where this is the case, molybdenum is an excellent material. This metal, similar in many respects to tungsten, is refined and made into contact points in a manner somewhat similar to the tungsten process just described.

Molybdenum contact points have been found especially useful for such devices as telegraph relays, where they are rapidly replacing silver. One railroad which has installed a large number of molybdenum contact points has found that they last, on the average, 50 times as long as silver, and where silver contacts required dressing and adjusting once a day, molybdenum contacts on the same relays operated two months with no attention whatever.

Another road installed molybdenum contact points on a pole changer, where silver had given trouble because of the difficulty of maintaining the exceptionally short armature travel, coupled with a heavy current of 320 volts and 30 milliamperes. The molybdenum contacts, adjusted to a total armature travel of only 0.002 in., have been in continuous service for more than a year. They are inspected and burnished once a week, but have never been filed.

Where it is desirable to solder molybdenum contact points to support members, this can be done by ordering the contacts coated with a special alloy which bonds easily with solder.

The successful design of contact points calls for a special training in electrical engineering combined with a practical working knowledge of certain rare metals. Comparatively few men have this training, and most of these are concentrated in the research laboratories of companies manufacturing contact points.

No specific set of rules or formulæ can be applied to the design of a set of contact points for any given device. Every condition must be studied in itself—the kind and volume of current carried, the frequency with which circuits are to be made or broken, the application of magnetic or mechanical contact pressure, the damping or eliminating of arcs, the dissipation of heat, the method of adjustment —all these are important factors.

So far as it is possible, dimensions and types of contact points are now being standardized. In the automotive ignition field, this standardization is fairly complete. In other fields it is under way, but much is yet to be accomplished.

Frequently designers may save time and money by making slight adaptations in their product, enabling it to conform to an existing standard contact point, which may be bought from stock like binding posts, switches or fuses.

However, the function of contact points is so vital that this should be done only after the designer has thoroughly satisfied himself by careful tests that the contact points perform perfectly.

The designer of electrical devices will do well to consult with manufacturers' engineers when it comes to the specification of contact points. Most manufacturers maintain research laboratories especially for the study of customers' problems and offer consultation without cost.

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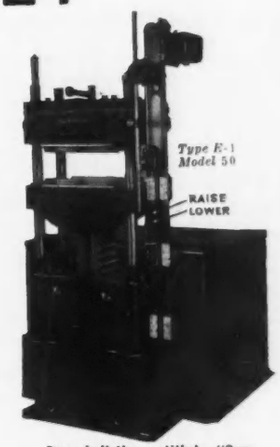

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What's NEMA Doing?

A department covering activities of the divisions, committees and sections of the National Electrical Manufacturers Association

Nema Information Given in New Annuary

Information on Nema is included in the Producers' Council Annuary for 1930-31, which was issued July 1. Under the Nema article is a list of members' products dealt with in the Association, a list of literature published and an outline of the Association's history, organization and objects. The Annuary is distributed free to American Institute of Architects members, unaffiliated architects, the architectural press, architectural schools, engineers and council members.

Endorsement of Outside Standards

The following standards of other organizations have received the indorsement of Nema's Casualty and Fire Prevention Committee:

Underwriters' Laboratories Standard for flexible non-metallic tubing and the American Standards Association safety code for use, care and protection of abrasive wheels.

Moore Nominated for Correlating Committee

R. W. E. Moore, Westinghouse Electric and Mfg. Co., has been nominated for appointment to the special correlating committee of the Electrical Committee of N. F. P. A., which is engaged at present in ironing out discrepancies in various parts of the National Electrical Code.

Revision of Motors and Motor Circuits

Steps are being taken for the revision of code section 808 on motors and motor circuits to clarify the intent with regard to the motor full load current to be used in determining the wire size for the motor circuit.

Requests and Proposals for Code Changes

Nema announces that requests for article committee consideration of proposed changes in the National Electrical Code should be sent to the Casualty and Fire Prevention Committee as soon as possible in order that they may receive consideration at the next meeting of that body.

Nema Shows New Tariff Law Effects

Possible effects on electrical manufacturers of the new Tariff Law are outlined by the Tariff Committee of the National Electrical Manufacturers Association in a report to the Board of Governors of the

NEMA STATISTICS

Products		Period	1930 Dollars	1930 Units	Companies Reporting	1929 Dollars	1929 Units	Companies Reporting
ELECTRIC MOTORS: A. C. 1 to 200 h.p. General Purpose, incl. Control Equipment, excl. Spare Parts.	*Orders*	*April*	3,040,530	26,751	20	Not Reported		
		March	3,586,770	32,124	20			
	Billings	*April*	2,939,178		20			
		March	3,463,272		20			
D.C. 1 to 200 h.p. General Purpose, incl. Control Equipment, excl. Spare Parts.	*Orders*	*April*	931,822	2,669	16	1,258,364		18
		March	942,556	3,089	16	942,665		18
	Billings	*April*	875,083		16	922,220		18
		March	833,183		16	703,848		18
Fractional Horsepower.	*Orders*	*April*	2,517,728	205,505	15	Not Reported		
		March	2,575,318	203,962	15			
	Billings	*April*	2,500,701		15			
		March	2,152,684		15			
LAMINATED PHENOLIC PRODUCTS	*Billings*	*April*	910,650			1,409,531		8
		March	959,513		8	1,299,437		8
INDUSTRIAL REFLECTORS.	*Billings*	*April*		107,040	5		126,948	5
		March		108,210	5		134,751	5
WELDING SETS Single-operator Variable Voltage Sets.	*Orders*	*April*		261	6		371	6
		March		251	6		443	6
VULCANIZED FIBRE Inter-company sales excluded.	*Domestic Billings*	*April*	621,585		7	812,032		7
		March	613,873		7	827,788		8
POWER SWITCHING EQUIPMENT Indoor disconn., switches, etc., single pole, not included in switchboards.	*Orders*	*April*	191,276		11	200,564		12
		March	155,095		11	162,578		12
Outdoor disconn. 1 pole, not included in switchboards, horn gap switches, etc.	*Orders*	*April*	576,942		11	400,396		12
		March	465,117		11	521,874		12
ELECTRIC FURNACES Resistance Type, below 50 kw.	*Orders Entered*	*April*	76,035	*187	9	126,643	*414	9
		March	81,428	**245	9	151,155	**374	9
Resistance type, 50 kw. and over.	*Orders Entered*	*April*	509,954	†31	9		†23	9
		March	63,137	‡7	9		‡29	9

1930 *Total Kw., 1,047; **Total Kw. 1,053; †Total Kw., 11,411; †Total Kw., 1,567.
1929 *Total Kw., 1,558; **Total Kw. 1,920; †Total Kw., 4,363; †Total Kw., 5,214.

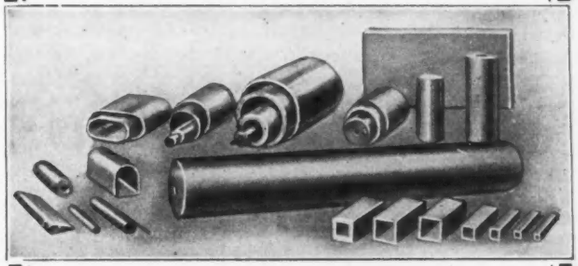
The Mark of Quality · The Mark of Quality · The Mark of Quality · The Mark of Quality

Plastics and Hard Rubber in every conceivable form—nationally advertised and bearing the "Mark of Quality"—these are the products upon which this company has built an enduring reputation for over a third of a century.

Moulders Since 1897

Jos. Stokes RUBBER CO.
TRENTON, N. J.

Quick Delivery



All kinds of Insulation

Bakelite, Insuline, Hard Rubber, Ebony Asbestos Wood, Vulcanized Fibre, Transite, Fish Paper.

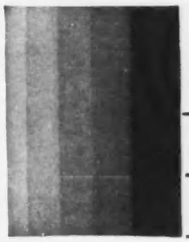
Sheets, rods, and tubes of all thicknesses and dimensions—furnished to manufacturers, experimenters and laboratories on short notice—24 hour service.

Furnished either in plain material or completely cut, drilled, engraved or stamped to specifications.

Complete machine shop for drilling, engraving and stamping.

No Order Too Large or Too Small

INSULINE CORP. OF AMERICA
78-80 Cortlandt St. New York, N. Y.



PYROXYLIN LACQUERS

Regardless of what your finishing problem may be, the complete facilities of our Service Laboratory are constantly at your disposal without cost. Here scientific knowledge brings about the most practical and economical solution. "The Acknowledged Standard Since 1884."

WHEN you choose a lacquer today nothing should be taken for granted.

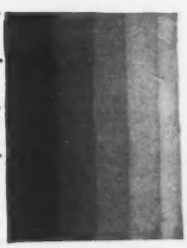
To develop in lacquer the highest degree of quality and uniformity requires the strictest adherence to scientific standards.

In our laboratories absolute control at all times over basic raw materials and chemical processes—continuous research—constant experimental testing and checking, have made Zapon Pyroxylin Lacquers superior for every use. This explains why it is decidedly more economical and satisfactory to insist on Zapon.

Upon the confidence of the buyer rests the reputation of Zapon steadily growing through nearly a half century to undisputed leadership.

THE ZAPON COMPANY
STAMFORD, CONN.

ZAPON



Association dated Aug. 4, 1930.

The pertinent portions of this report are as follows:

"The important change is the insertion of the new Par. 353, prepared as a result of the work of our Committee, which for the first time definitely segregates the bulk of electrical products in terms so clearly stated that there can be little opportunity for misinterpretation. This paragraph is worded as follows:

> 'Par. 353. All articles suitable for producing, rectifying, modifying, controlling, or distributing electrical energy;
>
> 'electrical telegraph (including printing and typewriting), telephone, signalling, radio, welding, ignition, wiring, therapeutic and X-ray apparatus, instruments (other than laboratory), and devices; and
>
> 'articles having as an essential feature an electrical element or device, such as electric motors, fans, portable tools, furnaces, heaters, ovens, ranges, washing machines, refrigerators, and signs;
>
> 'all the foregoing, and parts thereof, finished or unfinished, wholly or in chief value of metal, and not specially provided for, 35 per centum ad valorem.'

In the Tariff Act of 1922 the intention of Congress was clearly to classify electrical products in general under the basket clause of the Metals Schedule at 40 per cent duty, but a new definition of 'machines,' adopted by the Courts, resulted in most of this material being imported under the heading of 'machines' at a duty of 30 per cent. The new paragraph, therefore, removes all uncertainty as to classification and provides a rate somewhat less than we had requested but greater than actually had been applied in most instances in the past.

The wording of this new paragraph is, also, carefully arranged to make proper provision for the duty on parts of electrical devices. Under the old law, parts of machines were imported at the same rate as complete machines; namely, 30 per cent, irrespective of the material from which they were made, and porcelain bushings, for instance, for oil circuit breakers were imported at that rate of duty instead of 60 per cent, which should have applied in accordance with the rate on articles composed of porcelain. The new paragraph covers parts of electrical devices only where they are made wholly or in chief value of metal. If the material of which they are chiefly composed is other than metal, they will, therefore, automatically be classified under their proper paragraphs.

A few other changes have been made in the new law, which affect products in which electrical manufacturers are interested, some increases and some decreases, but these are confined in each instance to a limited line of products."

Convention Arrangements Going Forward

Arrangements are going forward rapidly for the next annual meeting of Nema, to be held in the Chamberlin-Vanderbilt Hotel, Old Point Comfort, Va., Oct. 20. A large attendance is expected.

Industrial Control

(*Continued from page* 70)

and the motor is thereby safeguarded against current surges that will result from careless manipulation of a manual control. Furthermore, the operator is not distracted from the work of his machine by paying attention to the careful manipulation of a manual controller. He can push buttons or throw a master switch back and forth with full assurance that the motor will not be abused thereby.

(3) It is possible to install the magnetic controller where space is conveniently available, off at one side or slung up overhead out of the way. Magnetic control can be more easily installed in a direct line from the power supply to the motor, merely running pilot wires to the operator's position. This often makes possible considerable economy in wires and cables.

(4) The automatic acceleration of the motor, as well as the case of bringing it quickly and safely to rest, are also of advantage in safeguarding the driven machinery and the material that may be in it from undue strain or breaking.

(5) Under conditions of frequent and heavy duty, magnetic control has much longer life than manual control even with equally sized contact making parts and equally efficient magnetic blowouts. Magnetic switches close and open with a quick action which is not possible with manually operated contacting devices. Magnetic controllers will also be found more accessible for inspection and repair. From every standpoint, therefore, they are easier to maintain in good operating condition.

(6) From the standpoint of safety to operators and other persons, the magnetic controller is superior, because it can be located out of the way and is less likely to be tampered with. Furthermore, it lends itself to quick stopping by emergency switches and, because of the fact that it will more easily and accurately accelerate the motor and machinery, is an element of safety.

Electrical Materials Commonly Used—Cork

(*Continued from page* 69)

them. Cork washers are used on certain lamps as a cushion between metal and onyx columns or bases. During electroplating, the bulb holes of reflectors are plugged with corks. Cork wheels are used in polishing cut and etched illuminating glassware.

Cork gaskets have found wide acceptance for use under the cover-plates of conduit fittings, such as the Crouse-Hinds condulets. In transformers, cork gaskets eliminate moisture and sediment between top and case, and cork washers prevent breakage of porcelain tops in cutouts. The fuse element on high voltage transformers is held by cork. Between porcelain parts of certain insulator types cork serves as a cushion.

Cork gaskets are frequently used between the cover-plate and casing of certain types of motors, and cork seals occasionally in connection with anti-friction bearings on motor shafts.

A good deal of cork is used in machinery for the manufacture of electrical apparatus as, for instance, on tubular looms turning out rubber-insulated lamp cord. Cork rings play an important role in these.

In addition to its use in the form of bushings and gaskets for potheads, switches, disconnects, etc., in all of which it acts as a seal, cork, made up into tile floors or tile mats, and placed in front of switches, is used for the protection of power plant operatives.

The largest manufacturers of electrical household meters use cork gaskets between the metal base and the glass case, the cork acting as cushion as well as seal in this use.

Manufacturers of electrical tools use cork to prevent oil leakage or as a friction drive.

Numerous as are the uses to which cork and cork products are put in electrical manufacturing at the present, their range of service can be widely extended, present uses suggesting others which it will be well to consider in choosing materials for new products.

Right there

ONEIDA FLEXIBLE COUPLING

ELECTRICAL manufacturers are successfully using the ONEIDA Flexible Coupling on automatic water pumps. washing machines, electric refrigerators and many other products. This flexible coupling, between motor and machine, absorbs the shock of sudden stops and starts —lengthening the life of both units.

ONEIDA Flexible Coupling is made in many sizes to fit fractional horsepower motors. Send us the diameter of shaft and length and we will forward sample for trial.

DELBEE RUBBER CO., *Syracuse, N. Y.*

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MILLS IN NEW JERSEY AT RIEGELSVILLE AND MILFORD

If it's fibre parts, or fibre tubing..use BRANDYWINE

Fibre Tubing is our main product. We turn out more vulcanized fibre tubing than anything else in fibre manufacture.

We are shipping, daily, thousands of pieces of tubing, cut to length, of small and large diameters—whatever you want within our scope.

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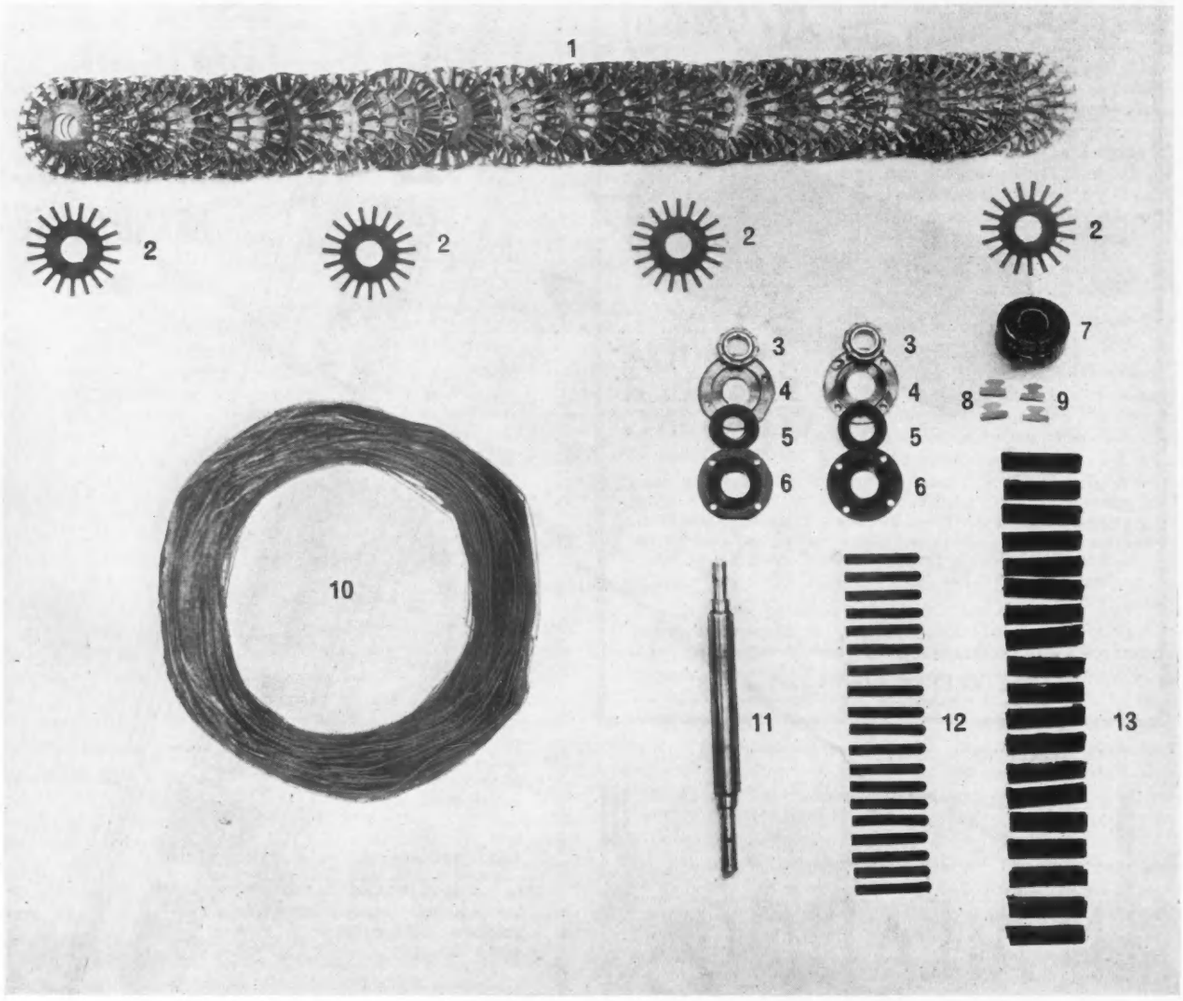
Motor Armature Components



MOTOR armature components, of course, vary in kind and quantity, depending upon the size and type of motor, but this illustration shows the components of a typical fractional horsepower d.c. motor armature. Each different kind of part is indicated by a different number, and name and material of each part are given below

Table of Parts and Raw Materials Used in Motor Armature

Part No.	Title	Material
1	Armature laminations	Sheet steel
2	Armature spacers	Fiber
3	Ball bearings	Steel
4	Oil seal ring	Steel
5	Washer	Felt
6	Oil seal ring cover	Brass
7	Commutator	Copper, mica, steel
8	Commutator bars	Copper
9	Commutator insulation	Mica
10	Armature wire	Copper, insulation
11	Shaft	Steel
12	Slot wedges	Fiber
13	Coil cells	Fiber, fish paper

FOR a long time ELECTRICAL MANUFACTURING has devoted two pages of each issue to some distinct motor market. On pages 48 and 49 of this issue will be found a suggestion of the market for motors supplied for machines that use many motors. Also on pages 71 and 72 will be found figures on the great export market for motors. These figures show the number and kind of motors sold to foreign countries during the month of May and compares this figure with that of a year ago

FIBRE

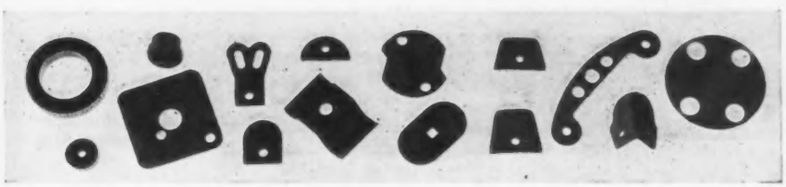
. . . in thousands of shapes and sizes . . . or rods, tubes, and sheets

Get a sample of OHMOID

An approved laminated electrical insulation, having tremendous dielectric and crushing strength. Shock proof, non-deteriorating, and impervious to age, oil, grease and ordinary solvents. Test it yourself.

Wilmington Fibre Parts are giving satisfaction to electrical manufacturers all over the country. Our production capacity is 3,000,000 pieces daily, so there is no chance of our "slipping up."

For your own fabrication, we always carry a large supply of fibre rods, tubes, and sheets.



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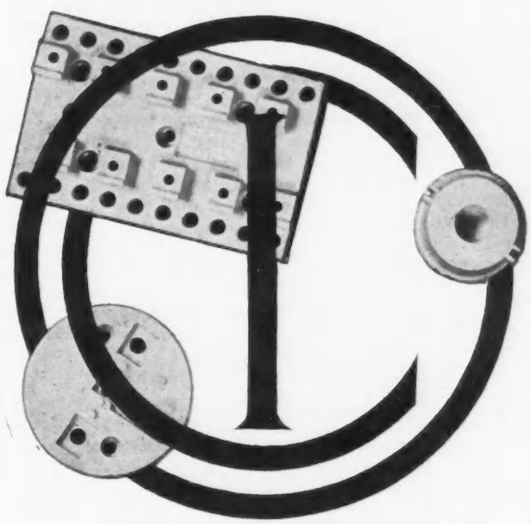

Colonial-*Quality*

Special Electrical Porcelain and Refractory Porcelain

COLONIAL INSULATOR CO.

Established 1894

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Distinctive as to DESIGN.

Distinctive as to CONCEPTION.

Distinctive as to MATERIAL.

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AMERICAN LAVA CORPORATION

1425 Williams St. Chattanooga, Tennessee

Manufacturers of Heat Resistant Insulators

Agency for Standardization Proposed

The formation of a joint agency to guide the standardization activities of the electrical industry was proposed at a meeting of the board of directors of the American Institute of Electrical Engineers. Action looking to the definite organization of such an agency is now under way. The functions of the proposed body would be to serve as the Electrical Standards Committee of the electrical industry in the United States; to serve as the Electrical Advisory Committee of the American Standards Association, and to act as the United States National Committee of the International Electrochemical Commission and of any other international organizations for the handling of electrical matters.

Standardization Society Becomes Member of ASA

The Manufacturers Standardization Society of the valve and fittings industry has just become a member body of the American Standards Association, according to an announcement from that organization. The society will now be on the ASA Standards Council and will share in the direction of national standardization activities.

Lecour, President of Credit Association

At the 32nd annual convention of the National Electrical Credit Association in Pittsburgh recently, Joseph H. Lecour was reelected president, Frank P. Bell was elected vice-president. At the session, the N. E. C. A. plan for closer credit interchange was drafted and published.

Maintenance Engineers Elect New Officers

At a recent meeting of the Electrical Maintenance Engineers, W. L. McCaslin, Armour & Company, was re-elected president; Arthur R. Dibben, Youngstown Sheet & Tube Company, was re-elected vice-president, and Loren M. Jenks, The Electric Association, retained as secretary-treasurer.

The executive committee is composed of the following members:

Paul J. Anderson, Link-Belt Company; Arthur R. Dibben, Youngstown Sheet & Tube Company; Robert W. Drake, International Harvester Company; F. M. Fitzgerald, Libby, McNeill & Libby; Thomas H. Grose, Montgomery Ward & Company; T. C. Hayes, Wilson & Company; Loren M. Jenks, The Electric Association; W. L. McCaslin, Armour & Company; John J. McKenna, Anaconda Wire & Cable Company, and N. E. Wilson, Standard Oil Company.

A. I. E. E. Issues Standards for Transformers

The American Institute of Electrical Engineers has issued new standards covering constant-current transformers of the moving-coil type and air circuit breakers. The standards for transformers, induction regulators and reactors and automatic stations have lately been revised. Proposed revisions in the standards for railway control apparatus are under consideration.

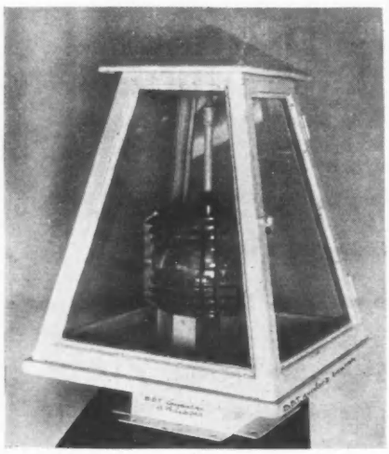
N. F. P. A. Makes Revision in Electric Code

The electrical committee of the N. F. P. A. made two revisions in the National Electrical Code at a meeting recently. The first was in paragraph C, section 3504, which now reads: "The source of illumination for the projected view shall be an approved lamp of a pattern expressly intended for stereopticon use or for motion picture projection." The second was in paragraph O, section 506, a minor change.

Lightolier Holds Sales Conference

The mid-year sales conference of the Lightolier Company was held July 30 in New York City. It was decided to expand all merchandise lines, to establish a new and lower price policy, to increase advertising and to enlarge the salesforce.

Guides Wandering Airmen



THE first aviators' flashing beacon to be installed by a civilian organization has been erected on the 22-story Atlantic Bldg. in Philadelphia. The light is a dioptric B. B. T. lighthouse and is visible for 20 to 30 miles

Octagon of Searchlights

IT'S simple to locate the Union Trust Bldg. in Detroit at night, with its five hundred million candlepower of light cast by 251 G. E. projectors

"Open Door Policy" Started By Radio Corporation

A new plan heralded in radio as "the open door policy" was promulgated by the Radio Corporation of America on July 23 when it announced that its patents for research and development of new apparatus for electrical entertainment in the home, would be offered to licensees on a royalty basis. These patents include not only many new radio innovations but some in the field of television. Already RCA, Westinghouse, Graybar and General Electric have announced that they will introduce a new super-heterodyne using four screen-grid tubes which are said to be four times as sensitive as the former models.

ASA Yearbook for 1930 Contains Index

The American Standards Association has issued its 1930 yearbook. The volume contains 104 pages and describes in detail the progress and accomplishments of the association during the past year. It also contains, for the first time, an alphabetical index to standards and projects recently added.

Estimate Sale of 4 Million Radios Next Year

Upon the completion of a nation-wide survey, it was estimated by the Radio World's Fair, New York City, that a minimum total of 4,000,000 radio sets will be

When Sales Come Hard
Cooke Seal Ring Helps

When buyers are choosey and difficult to sell, the presence of a Cooke Seal Ring on your machine may swing the choice to your product. For your dealer can show its superiority over any other seal or type of packing.

A mechanical device, revolving with the shaft, it forms a leak-proof ground joint against the gland face, reducing friction and wear and thus saving dollars for maker and user. Already used in scores of different types of machinery, it may be worth its weight in gold when business is hard to get. Write us today for description and prices.

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The Beacon

guiding you straight to porcelain satisfaction

Porcelain buying is not a gamble or a matter of guess work if you specify or insist upon geting STAR Quality. Star Porcelain is real quality and yet the price is as low as some inferior kinds. Let STAR Quality guide you

The STAR PORCELAIN COMPANY
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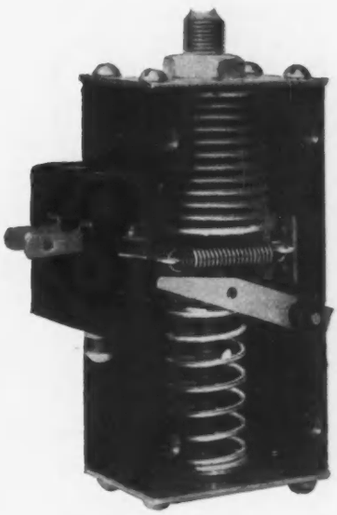

Kelvinator
Uses Norton Moulded Parts

KELVINATOR is another user of Norton Moulded Parts. The automatic electric switch for Kelvinator Electrical Refrigerators has a moulded housing for insulation and durability. Kelvinator came to Norton for these housings because they believed that Norton could most ably produce them on a quantity basis without in any way sacrificing quality. And Norton did.

You, too, may have a problem in moulding, used in the products which you manufacture. If you want the correct solution, let Norton Engineers help you. Careful design will cut manufacturing corners for you. Careful production will assure you of standardized parts whether furnished in thousands or millions.

Send us your specification sheet. Gladly will we co-operate with you in design, estimating and production. And no matter how complicated the requirement, we have faith in our ability to solve it, backed by the experience gained in working with thousands of America's leading manufacturers.

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Norton representatives may be reached in the following cities:

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Mr. W. M. Craig
228 North LaSalle St.

Bridgeport Conn.
Mr. J. S. Berthold
1115 Main Street

Detroit, Mich.
W. H. Mark Hanna
6-247 General Motors Bldg.

Hillside, N. J.
Mr. A. C. Hall
1262 Miriam Place

sold during 1930-31. Many of the models, yet to be manufactured, will receive their first public presentation at the Radio World's Fair, to be held Sept. 22 to 27 at Madison Square Garden.

Broderick Retires From G. E. Manufacturing Committee

Concluding 41 years of continuous service with the General Electric Company, John T. Broderick, secretary of the company's manufacturing committee, retired from active service July 1, 1930.

Mr. Broderick is one of the best known men in the manufacturing organization of General Electric. His period of service goes back to the early days of electrical development in America.

General Electric Orders Show Decrease

Orders received by the General Electric Company for the second quarter of 1930 amounted to $99,916,027, as compared with $119,351,248 for the corresponding three months last year, according to announcement from Gerard Swope, president The the six months ended June 30, orders received amounted to $190,313,758, as compared with $220,716,456 for the first six months of last year.

Insulating Materials, Subject of Report

Among the numerous committee reports given at the annual meeting of the American Society for Testing Materials at Atlantic City June 23-27 was that of the committee on electrical insulating materials. This body reported progress on a number of studies being made on insulating varnishes, molded and sheet insulating materials, liquid insulation, radio-frequency tests and resistivity and power factor measurements.

Some Statistics on Radios and Portable Lamps

On Jan. 1, 1930, there were 11,500,000 radio sets in use in the United States, according to statistics, a gain of 2,000,000 sets over 1929 and a gain of 10,000,000 over 1923. The leading electrical appliance for 1929 was the portable lamp, which hit the 7,000,000 mark; electric flatirons numbered 3,000,000 and came second. During 1929 there were 20,914,724 electrical appliances sold.

Add-A-Light Campaign Will Start This Fall

A campaign to make every American home "light conscious" will get under way late in October with the unqualified support of fixture and Mazda lamp manufacturers, central stations and electrical retailers. The drive, which is engineered and sponsored by the electrical industry, will be known as the Add-A-Light Campaign.

The purpose of the activity, according to a circular and prospectus released by the National Lamp Works of the General Electric Company, is to add at least one light in each American home. Portable lamps will be emphasized.

Electricity Tops All in Home, Women Agree

A Chicago *Daily Times* reporter recently asked six women the same question, "What modern invention is the greatest boon to the housewife?"

If one of the women had named an electric appliance, this story would have no importance. If two or three of them had named electric appliances, the news angle would not be enhanced. Even if the six women had named the same electric commodity, we wouldn't bother publishing this story. The importance of the yarn lies in the fact that all six of them, picked at random and naming different electric devices, were in unanimous agreement that electricity is the motivating force for the most beneficial inventions in the home.

RMA Board Holds Business Meeting

The Board of Directors of the Radio Manufacturers Association held their midsummer meeting July 30 at the General Brock Hotel, Niagara Falls, Ontario. Summer radio sales, fall business and production of new models were among the items discussed. The meeting was the first since the RMA convention at Atlantic City. President Morris Metcalf presided.

Williams Men Gather for Convention

Williams Oil-O-Matic Heating Corporation, Bloomington, Ill., has completed all details for its 1930 convention in Bloomington Aug. 18-19. Dealers and distributors of Oil-O-Matic refrigerators and oil burners will come together. A large gathering is anticipated.

Kokomo, Kingston Products Consolidate

Announcement is made of the merger of the Kokomo Stamped Metal Company, Kokomo, Ind., with the Kingston Products Corporation, of the same city. The Kokomo company manufactures roller skates, electric ranges and irons, and various electric toys. The Kingston corporation makes automotive electrical specialties and radio equipment. There will be no change in policy or distribution methods.

Street Lighting Trend Is Toward Larger Lamps

The most marked trends in modern street lighting practice are toward the use of larger lamps, higher mounting heights and, in downtown areas, the use of combination lighting standards and trolley poles, according to L. A. S. Wood, manager, Exterior Lighting Section, Westinghouse Electric & Mfg. Co.

"Many cities are realizing the advantages of developing a comprehensive street lighting plan covering the entire city, on which the individual installations can be built as and when financial and other conditions warrant," says Mr. Wood.

Nichols Succeeds Newill With G. M.

R. J. Emmert, president of General Motors Radio Corporation, Dayton, Ohio, announces the appointment of Harry J. Nichols, as chief engineer. Mr. Nichols succeeds E. B. Newill, who has been appointed vice-president of Frigidaire Corporation in charge of engineering.

Mr. Nichols comes from the Westinghouse Electric and Mfg. Co., where he was in charge of the radio engineering department at Chicopee Falls, Mass. He has had long experience in the radio and engineering field, particularly in the development of radio broadcasting equipment.

Mr. Newill is a native of Georgia and a graduate of Georgia Tech. Previous to his connection with General Motors Radio Corporation, he was with the Westinghouse organization.

Brevities

Chicago Nut Manufacturing Company, 2513 West Cullerton St., announces its consolidation with the Cleveland Wrought Products Company, Cleveland, Ohio. The consolidated companies will continue operations with no change in personnel, each as a division of the new company, which will be known as the United Screw & Bolt Corporation.

General Electric Company, Schenectady, N. Y., announces the retirement of D. C. Davis, assistant treasurer, after 41 years of continuous service. C. L. Kenyon will take Mr. Davis' place in charge of the general credit department.

Gould Storage Battery Company, 250 Park Ave., New York City, a $10,000,000 organization, has been purchased by the National Battery Company, St. Paul, it was announced by L. J. Shields, president. The main offices will be moved to St. Paul.

Federated Metals Corporation, 233 Broadway, New York City, has moved to 295 Madison Ave.

Dayton Scientific Corporation has recently been incorporated in Ohio, with headquarters in Dayton. Manufacturing of electrical and radio devices will be the company's functions. Officers are: Oscar Hulberg, president; H. L. Burns, vice-president and treasurer, and George F. Holland, secretary.

The Fiske' Auto-Electric Service Company, Beloit, Wis., has been incorporated.

Cutler-Hammer, Inc., Milwaukee, Wis., announces that on August 1, 1930, it took over as a subsidiary, the Reynolite Division of the Reynolds Spring Company, Jackson, Michigan. This transaction brought into the Cutler-Hammer line, the widely known Reynolite products including bakelite flush plates, plural plugs, etc. The Reynolite name marks the most complete line of bakelite flush plates in the world

PROPERLY MOULDED BAKELITE PARTS

insure absolute accuracy and exact uniformity in your product. They save time in assembling, eliminate expensive machining operations and lower your manufacturing costs. They require neither buffing nor polishing, yet have a fine and lasting finish—in colors if desired. Their tensile and dielectric strength is high—they are unaffected by moisture, oils and most acids. Ours is the largest plant in the Middle West devoted exclusively to the manufacture of moulds and custom moulding of Bakelite parts.

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Chicago Moulded Products Corp.

2144 Walnut Street :: Chicago, Illinois

Subsidiary to Plymouth M'f'g Co.

REFRACTORIES

of Quality and Dependability

Our thorough knowledge and rich experience in refractory manufacture enables us to satisfactorily solve any problem involving this application.

We make a refractory capable of resisting high voltages and continuous heating and cooling without spall or spit-off. The strength of material insures that these refractories will sustain heating elements at maximum temperatures.

Our complete line includes refractories for electric ranges and other household appliances, tubes and cores for all resistance windings. Also a very important product—heating element supports for electric furnaces.

Write us for advice on your refractory problems.

Send us your specifications. Let us work with you.

The ELECTRICAL REFRACTORIES CO.,
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Cleveland—Insulation Materials Co., 3231 Carnegie Ave.

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• Send Coupon for Samples •

MANY leading electrical manufacturers are saving time, trouble and labor through the use of Stone's Paper Tubes. Use them for *insulation shields* to prevent contact between the wiring and shafts of armatures; for *insulation sleeves* to slip over spliced wires; for *coil form supports*. Protect armature shafts, threaded shaft ends, etc., against paint or varnish when spraying, brushing or dipping adjoining parts. These are just a few of the many uses for Stone's Paper Tubes.

We make an infinite variety of sizes (up to one-inch diameter), colors and coatings in open and closed end tubes with various degrees of wall thickness. Large production, specially designed machines, and forty years' experience enable us to serve you promptly and economically. Send coupon for samples and practical suggestions.

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Please send us free samples of Stone's Paper Tubes and list of helpful uses.

Name of company.....

Address.....

City..... *State*.....

Utah Radio Products Company, 360 N. Michigan Ave., Chicago, announces that Leslie F. Muter has been appointed vice-president in charge of sales.

Superheater Company has moved from room 801 to room 1325 in the Peoples Gas Building, Chicago.

General Electric sales for the half year just past show an increase of $3,000,000 although net income decreased slightly.

Goslin-Birmingham Manufacturing Company, Birmingham, has been merged with the Whiting Corporation, Harvey, Ill., it is announced. The Goslin-Birmingham Manufacturing Company is the successor to the old Birmingham Machine & Foundry Company and the Joubert & Goslin Machine & Foundry Corporation and its subsidiaries.

Eclipse Engineering Company, Newark, N. J., has been incorporated with 100,000 preferred and 2000 common shares, to manufacture and deal in motors.

Allen Manufacturing & Electric Corporation, Newark, N. J., has moved to Lawrence, Mass., where it will maintain its executive offices and general plant.

General Electric Company featured an automatic photo-electric door opener at the Railway Supply Manufacturers' Association Convention in Atlantic City recently.

Anaconda Wire & Cable Company, Inc., California, announces the following changes in the addresses of its three Pacific Coast warehouses: In San Francisco, 360 Ninth St.; in Los Angeles, 430 Colyton St., and in Seattle, 914 First Ave.

Jefferson Electric Company, Chicago, has formed a Canadian company, the Canadian Jefferson Electric Company.

Kuhn & Jacob Machine & Tool Company, Trenton, N. J., announces that H. L. Amdury is the company's representative in the New York area and the New England States.

CeCo Manufacturing Company announces the appointment of Call, Carley & Jordan, Richmond, Va., as factory representatives in the Southern territory.

De Walt Products Corporation, Lancaster, Pa., manufacturer of high speed-cutting equipment, has moved into a new building in Lancaster to accommodate the rapid expansion of the company.

Chase Brass & Copper Company, Waterbury, Conn., has opened a new warehouse in Pittsburgh. It constitutes the nineteenth Chase warehouse in the country.

Electrotrim, Inc., Union City, Ind., announce the appointment as sales manager of A. H. Noelke, recently resigned from Paramount Electric Company, Chicago, where he held the same position. Electrotrim is a new development in extension wiring.

Suttle Equipment Company, Lawrenceville, Ill., no longer maintains its office at 400 N. Michigan Ave., Chicago.

Sylvania Products Company, Emporium, Pa., announces a price reduction on four of its radio tubes.

Coming Conventions

National Electrical Manufacturers Association—Annual meeting at Old Point Comfort, Va., Oct. 20-24.

Institute of Radio Engineers—Toronto, Canada, Aug. 18-21.

Illuminating Engineering Society—Twenty-fourth annual convention at Hotel John Marshall, Richmond, Va., Oct. 7-10.

American Electrochemical Society—Convention Hotel Statler, Detroit, Sept. 25-27.

American Institute of Electrical Engineers—Pacific Coast Meeting, Portland, Ore., Sept. 2-5; District meeting, Philadelphia, Nov. 13-15.

Eastern Association of Electrical Inspectors—Annual Meeting, Pittsfield, Mass., Sept. 22-24.

National Electrical Credit Association—Annual meeting, Philadelphia Chapter, Nov. 14.

International Association of Electrical Inspectors—Convention, Chicago, Ill., Sept. 15-17; Northwestern section meeting, Bellingham, Wash., Aug. 25-27.

National Association of Fan Manufacturers—Fall meeting, Detroit, Mich., Oct. 17.

National Electrical Wholesalers Association—Fall meeting, Hotel William Penn, Pittsburgh, Pa., Nov. 10-14.

National Electric Light Association—Meeting Great Lakes Division, French Lick Springs, Ind., Sept. 25-27. Meeting New England Geographic Division, Swampscott, Mass., Sept. 29-30. Meeting North Central Division, Rapid City, South Dakota, Sept. 5-6. Meeting Rocky Mountain Division, Albuquerque, New Mexico, Oct. 20-22.

Ironing Machine Manufacturers Association—Fall meeting, Cleveland, Ohio, Oct. 3.

Copeland Products, Inc., Mt. Clemens, Mich., reports a satisfactory business volume for the first six months of the calendar year.

Manning Bowman & Company have moved their offices from 216 North Michigan Ave. to offices in the new Merchandise Mart.

Welded Products Corporation, Kansas City, Mo., has purchased an eleven-acre site, which it plans to develop into a new factory addition.

Moloney Electric Company has moved its offices from 431 South Dearborn Street to Suite 1150, 20 North Wacker Drive.

Cutler-Hammer, Inc., Milwaukee, Wis., announces that on July 1 it acquired all the common stock of Schweitzer & Conrad, Inc., Chicago, Ill., manufacturers of high voltage equipment.

Dayton Scientific Corporation has recently been incorporated in the State of Ohio. It will manufacture radio and electrical devices with offices in Dayton. Officers are: Oscar H. Hulberg, president; H. L. Burns, vice-president and treasurer, and George F. Holland, secretary.

Electromaster, Inc., Detroit, Mich., announces the appointment of Frederick P. Combier, of New York City, as vice-president. Mr. Combier was formerly assistant to the president of Servel, Inc., manufacturer of Electrolux refrigerators.

American Gas Accumulator Company, Elizabeth, N. J., announces the formation of an airport lighting division to act as the exclusive distributor of the airport and airway lighting equipment of the American Gas Accumulator Company, the B.B.T. Corporation of America and the Sperry Gyroscope Company, Inc.

Zenith Radio Corporation, Chicago, announces the appointment of Arthur W. Freese as superintendent of cabinet production.

Walser Automatic Timer Company, formerly of 342 Madison Ave., has moved to Chrysler Building, 405 Lexington Ave., New York City.

Clarke & Eagle, manufacturers' representatives, have moved from 208 No. Wabash Ave., Chicago, to 1503 Merchandise Mart.

Electron Relay Company, 83 Fourth Ave., New York City, has moved to 46 Lawton St., New Rochelle, N. Y.

Continental Industrial Engineers, Inc., have moved from 208 West Washington St. to 201 North Wells St., Chicago, Ill.

Zenith Radio Corporation announces the appointment of Edward G. Hefter as field representative in the Southwest.

American Coil Spring Company, 1451 Thirty-seventh St., Chicago, has moved to Muskegon, Mich.

Independent Pneumatic Tool Company, 606 W. Jackson Blvd., Chicago, manufacturer of Thor electric and pneumatic tools and airs compressors, has purchased the Cochise Rock Drill Mfg. Company, Los Angeles, Cal., manufacturer of rock drills and mining tools.

Titan Electric Company, Adrian, Mich., has been reorganized, recapitalized and incorporated. The company is now located in a new plant at Adrian and is engaged in manufacturing a line of fractional horsepower electric motors, generators, etc.

Westinghouse Electric & Manufacturing Company announces that R. L. Hermann, formerly transportation manager of the southwestern district, has been appointed heavy traction representative, with headquarters in New York City.

Frigidaire Corporation, Dayton, Ohio, announces a small, new model to meet the demands for a low-priced refrigerator.

Roche & Banas Electric Company, Buffalo, N. Y., announces that David Roche has sold his interest to Adam Banas, and that the corporate name has been changed to Adam Banas Electric Company, Inc.

Brewer-Titchenor Corp., Cortlandt, N. Y., has awarded the Austin Company, engineers and builders, a contract for the design and construction of four new buildings.

Present Your Molded Parts Problem to Experienced Molders

"ARC - Phenolic"

WILL SOLVE IT!

ARC "Phenolic" is, by virtue of its particular qualities of composition, perfectly adapted to the molding of highly specialized, intricate and individualized parts for electrical industries. The vast facilities and half century's experience of the world's largest molding plant will help you to solve your most difficult molding problem with "Phenolic."

American Record Corporation

Molded Parts of PHENOLIC for Every Purpose

BAKELITE DURITE LACANITE DUREZ

Principal Offices and Plant: *Scranton, Pa.*

NEW YORK 50 Union Square
CLEVELAND 4900 Euclid Bldg.
DETROIT 145 Eastlawn Ave.
CHICAGO 645 Washington Blvd.

FANSTEEL for Contact Points

Laboratory Control . . . *over every step in every process*

To make contact points perform better and last longer, Fansteel invented the process of sawing contact discs from rods, presenting *end grain* metal as the contact surface.

To guard against impurities in metal or defects in manufacture, every step in every process is under constant laboratory control.

Fansteel will design contact points for your product, or you may select from a large stock of standard sizes and types. Write for recommendations and prices.

FANSTEEL PRODUCTS CO., INC.
NORTH CHICAGO, ILL.
Pioneer Makers of Tungsten Contact Points

OHMITE

new REFERENCE BOOK

Invaluable to every Electrical or Radio Engineer.
Send for your copy . . . no charge.

Ohmite Manufacturing Co.
633 N. Albany Ave., Chicago, Ill.

Branch Offices and Agencies

American Bosch Magneto Corporation, Springfield, Mass., announces the appointment of R. M. Peters as Chicago sales manager to succeed Herbert Shoemaker.

Wagner Electric Corporation, St. Louis, Mo., announces the addition of Herbert Hoover to its Philadelphia branch sales office.

Southeast Joslyn Company, a subsidiary of the Joslyn Manufacturing and Supply Company, has selected Birmingham as the distributing center for the Southeastern States. The company has leased a building at Second Avenue, South and Twelfth Streets, as its headquarters.

Westinghouse Electric Supply Company announces that Walter Ferry has been placed in charge of the appliance and radio sales division for Newark and Trenton, N. J.

The Midland Division of the National Lamp Works of the General Electric Company has moved its offices from the Adams-Franklin Building, to the 20 North Wacker Drive Building, Chicago.

The Louis Allis Company, manufacturer of D.C. and A.C. motors, Milwaukee, Wis., announces the opening of three new sales offices and the men in charge. They follow:

1715 Union Bank Building, Pittsburgh, Pa. C. O. Sargent.

215 B East Archer Street, Tulsa, Okla. W. Woobank.

4441 Santa Fe Avenue, Los Angeles, Cal. A. R. Thomas.

Ohio Electric Manufacturing Company, Cleveland, Ohio, announces the appointment of R. W. Carlisle, as its factory representative in the sale of fractional horsepower motors. His branch office will be in the Indiana Pythian Building, Indianapolis.

Erie Malleable Iron Company, Erie, Pa., wishes it known that its new Eastern District sales manager is R. E. Peoples. Mr. Peoples, previous to his appointment was salesman for the General Electric Supply Corporation in New York.

Chicago Steel Tank Company, Chicago, Ill., announces the election of J. K. Burg to the office of vice-president. Mr. Burg will continue to head the eastern offices or the company in New York, Philadelphia and Boston.

Obituary

Frank Buchanan, superintendent of the headlight department of Crouse Hinds Company and an inventor of wireless signal devices, died June 23 at his home in Syracuse, N. Y. He was sixty-eight years old and had been with Crouse Hinds for twenty-seven years.

Walter Hall Tompkins, field manager of the Graybar Electric Company, died in Milwaukee, Wis., June 28, at his home. Mr. Tompkins had been associated with the Graybar company for thirty years; during the past twenty years he had been field manager of the local office.

Manufacturers' Literature

ELECTRICAL MANUFACTURING *presents a digest of recently issued catalogs, bulletins and other advertising material. Manufacturers are invited to send literature for review in this column.*

Automatic Temperature Control Company, Inc., Philadelphia, Pa.: Leaflet showing controllers, regulating valves, relays, time cycle contactors, electric heater controllers, interrupters, etc.

American Coolair Corporation, Jacksonville, Fla.: Twenty-four pages describing and illustrating Coolair electric fans.

Kaylite Manufacturing Corp., 138 Mott St., New York City: Kaylite Modernistic catalog No. 16 containing eighty-one pages of modernistically designed glass lighting effects, i.e., chandeliers, etc.

Uniflow Manufacturing Company, Erie, Pa.: Three bulletins showing Uniflow modern electric refrigeration, water systems, water softeners, clarifiers, water filters, gas and kerosene hot water storage heaters, septic tanks and pump accessories.

Standard Electric Stove Company, Toledo, Ohio: Twenty-eight-page sales and service manual for dealers and wholesalers, describing the Standard line of electric ranges and setting forth the market for them.

Nolu Oilless Bearing Company, Germantown, Pa.: Leaflet containing price list of Nolu bearings and directions for installation.

Adams Bros. Mfg. Company, 2500 North Ave. W., Pittsburgh, Pa.: 1930 edition in colors describing and illustrating gas and electric heaters.

Cleveland Crane & Engineering Company, Wickliffe, Ohio, electric tramrail division: Leaflet showing tramrail cranes and transfer bridges and the Cleveland system of overhead materials handling.

Worthington Pump and Machinery Corporation, Harrison, N. J.: Bulletin L-400 B-1 describing the new Worthington Multi-V-Drive for power transmission.

Delta Star Electric Company, Chicago: Bulletins 38-F and 39-A showing the clamp type bus bar and conductor fittings for round conductors and standardized outdoor high-tension "unit type" vertical break gang operated switches.

Lincoln Electric Company, Cleveland, Ohio: Forty page bulletin pictorially showing automatic arc welding by the electronic tornado process.

Erikson Electric Company, Boston, Mass.: Catalogs 150 and 160 describing Erikson lighting equipment and modern illumination; illustrating also store lighting apparatus and reflectors with installation details.

For the Man Who Keeps Your Lists

Because the following manufacturers are now either out of business or have discontinued making an electrical product, we have removed their names from our lists:

Earnshaw Mfg. Company, Broadway & Baltimore, Camden, N. J.

Vacuum Candy Machinery Company, 74 Pearl St., Jersey City, N. J.

National Ever-Lite Corporation, Harrisburg, Pa.

W. C. Lipe, 208 S. Geddes St., Syracuse, N. Y. Electric machinery.

Lee Suction Cleaner Corporation, 5062 Detroit, Mich.

Firm Name or Address Changes:

Wellman Engineering Company, 7000 Central Ave., Cleveland, O., successor to Wellman, Seaver, Morgan Company.

Milwaukee Power Pump Company, 26th & Montana Ave., Milwaukee, Wis., successor to Heil Company.

Ohio Art Company, Bryan, O., successor to Delta Products Mfg. Company.

R C A Radiotron Corporation, 215 S. Fifth St., Hoboken, N. J., successor to Radio Victor Corporation of America.

The following manufacturers have been added to our lists either because they are new concerns or old companies which are now making some electrical product:

Eclipse Aviation Corporation, East Orange, N. J.

Holbrook, Merrill & Stetson, 904 N. Main St., Los Angeles, Cal.

Fountain Equipment and Mfg. Company, 2025 Elm St., Cincinnati, O.

Armature Rewinding Company, 167 Brighton Ave., Boston, Mass.

Concert-Trope Mfg. Company, Indianapolis, Ind.

Rowley Electric Motor Service, 138 W. Midwest Ave., Casper, Wyo.

Newark Armature Exchange, 176 Central Ave., Newark, N. J.

Frankenberg Refrigeration Company, Bellville, Ill.

University Electric Company, 1329 Amsterdam Ave., New York City.

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of Electrical Manufacturing, 461 Eighth Avenue, New York City.

"L R Co" Receptacles.
"Aspinall" Soldering Fluid.
"Burrows" Therapeutic Lamp.
"Williams" Commutator Dressing.
"Flint" Waffle Iron.
"Defiance" Cigarette Lighter.
"Pioneer" House Pumps.
"Indulet" Fittings.
"Thermodyne" Therapeutic Lamp.
"Autochauffe" Heater for Bakery Ovens.
"Wilson" Box Supports.
"Raylite" Automobile Lamp Bulbs.
"Merit" Attachment Plugs.

Pioneers

"BOONTON BAKELITE"

In little log or stone school houses of Colonial days, hardy, self-sacrificing men gave young America its rudimentary education. These little one-room shacks formed the beginning of our great universities.

The founders of Boonton Rubber started with a few definite facts about mouldings, and thorough principles of workmanship. They increased their knowledge and long ago were the first to use BAKELITE in the moulding of electrical insulation.

Why not submit your problems relative to the use of moulded parts to *the pioneers* whose rich experience insures a most economical solution.

BOONTON RUBBER MFG. COMPANY
223 Fanny Road
Boonton, New Jersey
Established 1891

Brawley felt feet

PROTECTION
that lasts
as long as
your product

If you make a product that should have the protective factors of FELT FEET, Brawley provides them with nail, wood or machine screw methods of attaching.

Nothing else will be as practical a safeguard, for Brawley Felt Feet will never need replacing. They cannot be destroyed, will not deteriorate, pull off or break off. They have been specified by many discriminating manufacturers after rigid tests; and your product should have the same lasting proof of protection.

Look for the name stamped in every one. Immediate shipment from large stocks of standard goods.

T. R. BRAWLEY FELT CO., Inc.
279 20th Street Brooklyn, N. Y.

Unvarying quality in

BAKELITE
MOULDINGS

This is our job—making moulds and doing the moulding, each step controlled. We inject quality and good workmanship into each piece.

Tell us what you want, and how many, and we will quote you.

KUHN & JACOB MACHINE & TOOL CO.
502 Prospect Avenue *Trenton, N. J.*

M.&W.Co. 1876
LACQUERS ENAMELS

Clear Prismlac No. 23

The New and Different Decorative Finish

Applicable to Smooth Metal, Wood or Composition.
Just Spray and Watch It Crystallize.
Air Dries in Less Than One Hour.
May We Suggest How PRISMLAC May Be Applied to Your Product?

Your inquiry is invited

MAAS & WALDSTEIN COMPANY
Executive Offices and Plants:
438 Riverside Ave., Newark, N. J.
Chicago Office and Warehouse: 1115 W. Washington Blvd.
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The border of this advertisement is a photographic reproduction of M & W Prismlac.

TOYCO
SPONGE RUBBER
Also
Solid Soft Rubber Specialties

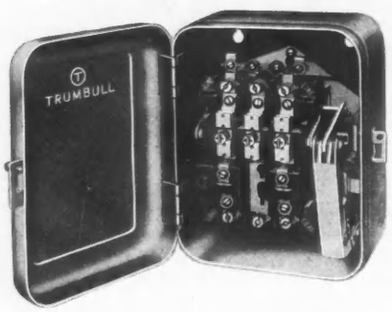
To shock-proof and insulate all manner of Electrical equipment. Send blue prints for prices and full particulars.

Dept. "F"
The Toycraft Rubber Co., Ashland, Ohio

New Goods for Your Inspection

Magnetic Motor Starting Switches

Trumbull Electric Mfg. Co., Plainville, Conn., offers a line of single and polyphase magetic motor starting switches with time



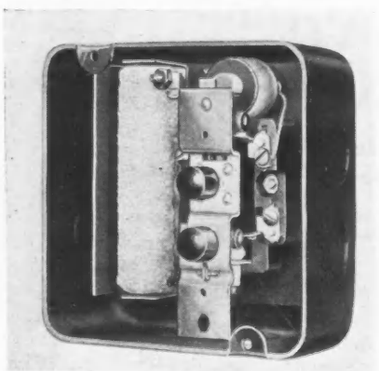
limit overload protection and under-voltage protection and release. They are available for 115, 230, 460 and 575 volt service. In the existing line the horsepower ratings range from 5 to 15 hp. polyphase and from 3 to 7½ hp. single phase; in other words, the switch rating is 30 amp. Relays are used for overload protection.

In the new line the horsepower ratings range from 3 to 7½ hp. polyphase and from 1½ to 5 hp. single phase for use with 115, 230, 460 and 575 volt service.

These switches have a current rating of 20 amp. Overload protection is obtained through a thermostatic trip, which is hand reset on the local control switches and automatically reset on the remote control switches.

Small Motor Starter

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis., announces a resistor type starter for fractional horsepower, D.C. and single-phase A.C. motors.



This starter is designed for those applications where power company rulings require that the inrush current of small motors connected to lighting circuits be held within definite limits, and where the high inrush current incident to starting across-the-line is otherwise objectionable. On starting, a resistance is inserted in series with the motor. As the motor accelerates and the inrush current decreases, the starter automatically short-circuits the resistor, connecting the motor across the line. The starter is push-button operated and provides overload protection to the motor. The inclosing case is a standard double wiring box which can be mounted on the machine or at any other convenient point. Starters are also available without the case for building into the pedestal or other part of the machine. Maximum horsepower ratings are ¼ hp., 115 volts, D.C., and ¾ hp., 110, 220 volts, A.C.

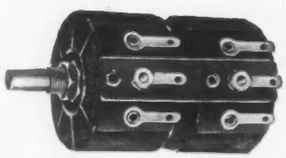
Baby Dynamic Speaker Unit

Racon Electric Co., 18 Washington Place, New York, offers its Baby Dynamic amplifying unit, which weighs 6½ lb., is

only slightly larger than a man's fist, but will handle an undistorted output of 10 watts without rattling. This unit has a maximum diameter of 5 in. The diaphragm is made of extremely light metal, using a patented method of cloth suspension. The diaphragm is dome-shaped for maximum strength. The casing of this unit is made of magnetic steel of high flux density, for the purpose of obtaining a concentrated magnetic field with a minimum of material and weight. Baby Dynamic is meant to be used in conjunction with horns of the exponential type. When used with the smallest drum-type exponential horn, the combination is said to be suitable for home use, and when used with the large type exponential horn the unit is suitable for indoor or outdoor public address systems.

Duo Type Volume Control

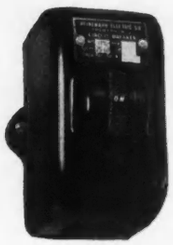
Clarostat Mfg. Co., 281 N. Sixth St., Brooklyn, N. Y., offers a duo-type, wire-wound volume control for the simultane-



ous control of two circuits. This device is made up of two standard volume control units, with tapered windings, if so desired, to match any resistance curve. The units are mounted in tandem, so as to operate with a single knob. Each resistance unit may be arranged for any resistance and may be electrically insulated from the other. A power switch can also be included in the assembly, so as to turn the power on and off by means of the single volume control knob. The manufacturer states that the knob of the volume control turns without noise even in the most critical radio circuits.

Motor and Light Circuit Breaker

Heinemann Elec. Co., Trenton, N. J., offers its Re-Cirk-It, a circuit breaker designed to replace switches and fuses in



motor and light circuits. It is a combination of a magnetic breaker with a thermostatically controlled inverse time limit. The thermostatic action alone will not cause this breaker to turn off the current, but it will absorb a starting overload not too large if the current, within a reasonable time, returns to the normal current the breaker is designed to take. Operation is dependent upon gravity. If the breaker is closed on a short circuit, the breaker mechanism operates independent of the handle. The calibration of the breaker cannot be altered or its action blocked so as to remove its protective features. The breaker will carry its rated current regardless of room temperature. Resetting is as simple as turning on a toggle switch. This breaker is housed in a Bakelite case. It is furnished in capacities from 4 to 15 amp. and corresponding horsepower ratings.

Self-Contained Ohmmeter

Jewell Elec. Instrument Co., 1650 Walnut St., Chicago, offers a self-contained ohmmeter in a case of molded Bakelite. This instrument, known as Pattern 89, has a 1½-volt flashlight cell inside the case, and is therefore independent of external

voltage supply. A convenient adjustment to correct for variation in the cell voltage is provided by a magnetic shunt. In operation the instrument can be adjusted to the cell each time a series of tests is made, and the result is a high degree of accuracy. This instrument combines the convenience of a self-contained resistance meter with the stability of a Bakelite case.

PORCELAIN by AKRON

WE do not offer ONE grade of porcelain to fill every requirement.

After many years of engineering and research work we have produced a number of porcelain compounds.

In our new factory equipped "up-to-the-minute," we can produce porcelain to fill your individual requirements—and at minimum cost.

Send us drawings of your special porcelain pieces, stating your needs. We may be able to offer you something interesting.

The answer to exacting requirements

THE AKRON PORCELAIN CO.
Akron, Ohio
Specialists in Porcelain

Porcelava

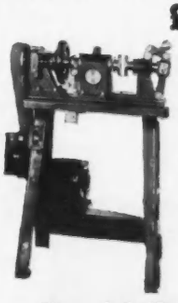
The best for Electric Heating Appliances

Our clay specialties, plain and threaded tubes, and Refractory Porcelain for Electric Heating Appliances are superior in every way; and "PORCELAVA" makes the best Pyrometer Insulation.

Burgess & Company
East Liverpool, Ohio
Factory at Wellsville, O.

Chicago Representative:
F. D. FARNAM & CO.
259 No. Wells St., Chicago, Ill

New Winding Machine for Universal Use



Unusually strong and rigid, with powerful clutch, this machine winds coils of any number of turns, of large or small wire, and at any speed. Spindle is free to turn by hand when machine stops. Quick-acting chuck slides on parallels for variable center distances. Complete with change gear and automatic control of turns. Ball bearings throughout.

E. R. SEIFERT
Syracuse New York

Rapid Production Machines

Relays for every current control job

—and particularly where the problem is difficult. Dunco Relays can always be relied upon. The new DUNCO CATALOG shows a large variety—it gives valuable engineering data, also.

DUNCO
RELAYS

STRUTHERS DUNN, INC.
138 N. Juniper St. Philadelphia, Pa.

SYNTHANE
Laminated Bakelite

Dependable Uniformity in Electrical and Mechanical Properties

DIELECTRIC STRENGTH
LOW WATER ABSORPTION
STRUCTURAL STRENGTH
LOW SURFACE LEAKAGE
CLEAN PUNCHING
MACHINEABILITY
IMPACT STRENGTH
APPEARANCE

SYNTHANE
CORPORATION OAKS · PENNA
NEW YORK, CHICAGO, CLEVELAND, SAN FRANCISCO
Sheets, Tubes, Rods, Fabricated Parts

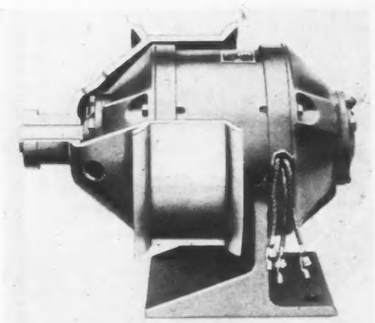
Coil Tester

Rubicon Co., 29 N. Sixth St., Philadelphia, Pa., announces a coil tester for detecting short-circuited turns and defective

insulation coils and windings. This tester will do three things: first, detect the presence of a single short-circuited turn in a coil of wire regardless of the total number of turns; second, it will detect defective insulation between layers and terminals, and third, it will tell how serious a given defect is—the number of shorted turns and the degree of insulation impairment. The operation of the instrument requires no technical skill. After plugging in the 110-volt, 60-cycle supply and closing the switch, the knob is turned until the spot of light indicates zero. The coils to be tested are introduced one by one into the Bakelite test cup shown in the accompanying illustration. When a coil is perfect, nothing happens, but when the coil contains short-circuited turns, or when the insulation is poor, the spot of light will move and the magnitude of this movement is a measure of the seriousness of the fault. The tester consists of a vacuum tube circuit, with which is associated a reflecting galvanometer of short period. Normally, there is no current through the galvanometer, which indicates zero, but when a defective coil is introduced within the cup, in which are imbedded the test coils, it will absorb a certain amount of energy and destroy the equilibrium of the circuit. Various sized test cups are furnished. Dimensions of the tester are 16½ by 7¼ by 7⅝ in.

Welded Conveyor Motors

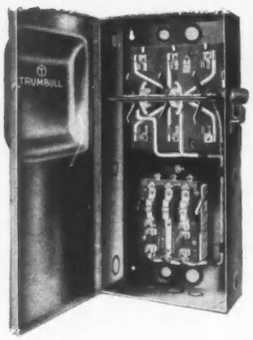
Reliance Elec. & Engineering Co., 1042 Ivanhoe Road, Cleveland, Ohio, has introduced several special motors for conveyor



work. These motors are each provided with a single heavy welded steel support so located that a pulley-type roller keyed to the motor shaft can rotate around the body of the motor. Various shaped rollers to suit the material to be conveyed can be used. The motors with rollers are lined up in tandem, the distance between being governed by the material conveyed. Motors are fully inclosed and are provided with asbestos and mica insulation for withstanding extremely high temperatures. Motor rotors and load are carried on large ball bearings.

Magnetic Motor Starting Switches

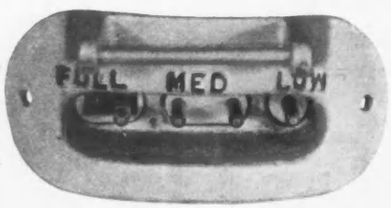
Trumbull Electric Mfg. Co., Plainville, Conn., offers a line of manually operated Type "A" motor reversing switches com-



bined in one cabinet with either a local or remote control magnetic switch with a maximum rating of 15 hp., using interchangeable self-resetting relays for time limit overload protection. Undervoltage protection or release is also available. These switches provide push-button control for starting or stopping the motor. Protection of the motor may be reversed by means of the manually operated Type "A" double-throw reversing switch. Both switches are capable of breaking the stalled rotor current of motors for which they are rated.

Series Parallel Contacts

Harold E. Trent Co., 439-43 N. 12th St., Philadelphia, Pa., offers a three-heat plug with series parallel contacts which



corresponds in theory to three-heat switches used on electric ranges and other electrical appliances. The three-heat plug contact combination uses a standard electric iron plug and a set of four contact posts. By the use of one specially designed post, the apparatus is said to be simplified. These fittings can be safely used on circuits carrying up to 1600 watts. The base is molded porcelain of sufficient length so that it can be attached to a receptacle, the screw holes being conveniently placed.

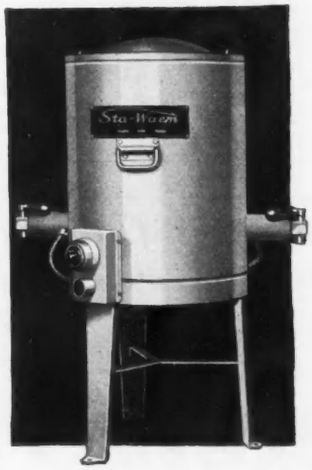
Strip-Clean Wire

Belden Mfg. Co., 4647 W. Van Buren St., Chicago, announces a rubber insulated lead wire that eliminates the troublesome

labor encountered in stripping ordinary rubber insulated wire. The manufacturer states that even stranded wire of this new type strips clean without sandpapering.

Sta-Warm Electric Heaters

Beckwith Machine Co., 402 Chestnut St., Ravenna, Ohio, has introduced a line of automatic heaters for maintaining at even temperatures such process materials as was, babbitt, rosin, enamel, sealing wax, stator compound, pitch, solder, cement, paraffine, and oil. By the use of these heaters any temperature up to 450 deg. Fahr. can be maintained automatically with less than 5 deg. variation. There are a number of distributed heater circuits in multiple and so connected to a thermostat that they are turned on and off as needed. When the heater is cold, as in starting, current is allowed to pass into all the circuits. When the required temperature has been reached, the thermostat automatically cuts out a part of the circuits one by one, until only enough are in operation to hold the temperature uni-



form. Each circuit completely encircles the heater from top to bottom, so that heat distribution is always uniform. When desired, an automatic time switch or manually operated booster switch can be supplied.

Largest Exclusive Manufacturers of Coils in the U. S.

BOLD STATEMENTS THAT EASTON COILS PROVE

[1]

THERE are no finer coils made anywhere today than EASTON Coils.

[2]

There are no more economical coils—quality and perfect, enduring performance considered—than EASTON Coils.

[3]

There is no organization better able to make Coils to your exact specifications than is EASTON with its long-experienced staff of Engineering and Manufacturing Experts.

Send your specifications to EASTON. All information and data furnished to our Engineering and Data Department will be held in strict confidence. Samples and quotations promptly furnished.

EASTON COIL COMPANY
EASTON, PA.
P. O. Box 237

Largest Exclusive Manufacturers of Coils in the U. S.

Exceptionally prompt service on

Commutators

and other parts

With a special commutator department, and improved plant facilities, we are able to give you exceptional service on commutators and other parts, such as—

Commutator Bars (forged, drawn or cast). Brush Holders, Copper Leaf and Gauze Brushes. Controller Fingers, Segments, Field Plates, etc. Switches. Non-ferrous Castings and Drop Forgings.

You can depend on Highest Quality—Prompt Service—Reasonable Prices.

It will pay you to make EUREKA your regular source of supply. A trial will convince you. Write us about your requirements.

EUREKA METAL PRODUCTS CORP.
91 Clay St. North East, Pa.

EUREKA

211

Do You Know?

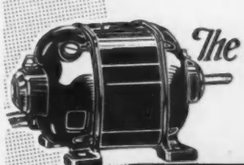
That Leland brush lifting motors are finding wide application in the oil burner and refrigeration fields where the quick-running characteristic is of paramount importance.

Do you know that the design of these motors is such that radio interference very rarely, if ever, occurs!

Leland Engineers not only pioneered along this specialized line years ago but have consistently maintained their position of leadership; with the result that, today, Leland Motors have become standard equipment on a great many of the most exacting appliances, both here and abroad.

A. C. Repulsion Induction
D. C. Compound Wound
A. C. Polyphase

All in Interchangeable frames



The Leland Electric Co.
Dayton·Ohio
U·S·A·

Leland

1/8 1/6 1/4 1/3 1/2 3/4 1 1½ 2 3

Motors

Unit Type Auxiliary Switch

Delta-Star Elec. Co., 2400 Block, Fulton St., Chicago, offers an auxiliary switch for use with oil or air-break switches, motor-operating mechanisms, etc. It can be

made to open or close the circuit at any desired position. If it is desirable to have one unit circuit opening instead of a circuit closing or vice versa, a simple adjustment permits this without taking the switch apart. A single unit switch is illustrated, but if desired it can be stacked twenty units high on a single mounting. The switch rated at 250 volts, 15 amps., will carry 35 amps. without exceeding A.I.E.E. specifications. Each unit is provided with card holders so that the circuits may be marked.

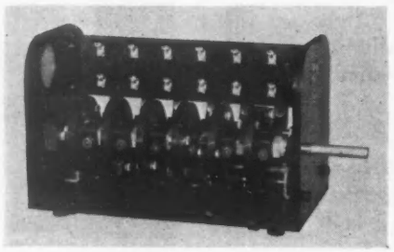
Weld-Built Motor

Electro Dynamic Co., Bayonne, N. J., offers its Weld-Built D. C. constant speed motor. The field frame is rolled from forged steel stock. Bearing bracket is built from angle iron, channel or bar stock, and reinforcing gussets at welds. Any standard make of ball or roller bearing supplied and assembled in the two-piece cartridge. The armature can be removed from the motor, and the shaft can be removed without disturbing windings and commutator connection. Coils are held in skewed slots to decrease noise to the mini-

mum. Mica insulation is used in slot section of coil. Large vent spaces are provided for ventilation. Assembled commutator has been seasoned and undercut. Main poles are built of laminations held together by welding. Interpoles are of bar stock with welded on coil supports. Main pole coils are layer wound with cotton thread spun between layers and woven at the ends to form pads against field frame and stabilizing coil. Interpole coils are double cotton covered square or strap wound on edge.

Cam-operated Limit Switch

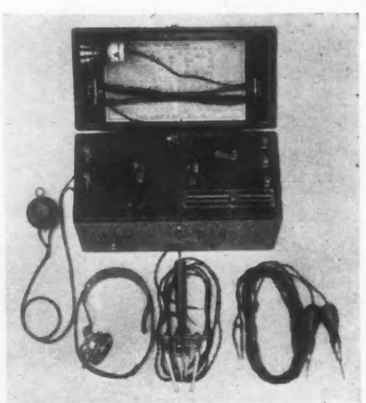
General Electric Co., Schenectady, N. Y., announces its LS-438 cam-operated limit switch for industrial control applications



which supersedes older types made by that company. This switch is enclosed in a cast case. Electrically it is a two-circuit switch that by a simple adjustment can be made either normally open or normally closed, or one circuit open and one closed. It is a snap-action, cam-operated device and can be obtained with either spring or star-wheel return with any one of four operating levers: a roller lever with a one or three-inch roller, a forked lever or a straight lever. The contact tips are interchangeable with those of standard G. E. cam-operated master and geared limit switches.

Field Tester

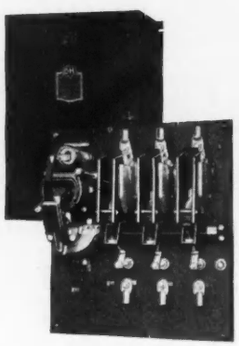
Century Electrical Co., 100 Randall Ave., Syracuse, N. Y., offers a field tester designed for testing the field coils and arma-



tures of D. C. motors and generators. With it field coils can be easily tested while in position on the pole pieces, and the weak coils detected. This tester can also be used for checking work in process of manufacture or repair. The instrument will instantly show the slightest degree of short circuit or open circuit. This instrument can also be used as an armature tester, detecting and locating shorts, open, wrong or crossed connections, and grounds, without unsoldering any lead wires from the commutator or disturbing the hoods. It will test a 50-hp. armature in about one minute. This company also offers an A. C. type field and armature tester and a D. C. and A. C. armature tester. The accompanying illustration shows the field tester.

Heavy Duty A. C. Contactors

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis., announces two heavy-duty A. C. contactors rated for maximum



capacities of 300 and 600 amps. The accompanying illustration shows the 300-amp. contactor. These contactors are generally applicable to all heavy-duty requirements. They are arranged for either two or three-wire control, have continuous duty operating coils, efficient magnet structure, and heavy, butt type solid copper contacts. An air cushion absorbs the shock of the magnet on closing.

Volt-Ohmmeter

Weston Electrical Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J., offers its Model 564 Volt-Ohmmeter, a self-contained radio instrument for voltage and resistance measurements and for checking continuity of circuit. This instrument can also be used in radio laboratories when extreme accuracy is not of prime importance. Equipment consists of a Model 301, 3¼-in. diameter meter with ranges of 3, 30, 300 and 600 volts and two resistance ranges, 0-10,000 and 0-100,000 ohms. These

six ranges are brought out to binding posts. Two toggle switches serve to connect the meter in circuit. All voltage ranges have a resistance of 1000 ohms per volt. A pair of 30-in. cables with long test prods is provided with each instrument.

Tradition in Commutator Building

It is generally accepted that a commutator coming from Cameron must be RIGHT—there is never a question as to its efficiency, irrespective of its ultimate use.

That is a tradition born of many years spent in conscientious commutator building.

To insure *immediate* service, Cameron always keeps in stock not less than 100,000 pounds of super-fine, hard-drawn copper bars in 1200 varying sizes.

Cameron

We are in an ideal position to take care of your requirements for automatic screw machine products, also.

Electrical Mfg. Co.
Ansonia, Conn.

WILCOLATOR

TYPE "S" RELAY

12-50 V.	30 Amp.
115 V.	30 Amp.
230 V.	15 Amp.

Alternating Current
2¼" wide—3¼" high

A single pole double break relay for mounting conditions where maximum capacity is desired in a limited space. Common or separate coil control.

A complete service on relay problems is yours for the asking. Write us.

THE WILCOLATOR COMPANY
Newark, New Jersey

and now the
ENAMELED
SLIDE RESISTOR

to fill a long-felt need

PAT. APP. FOR

All the convenience and flexibility of the adjustable slide resistor PLUS *the ruggedness and high wattage of the vitreous enameled resistor!*

WE OFFER YOU a radically new device "for what it is worth"—and enthusiastic expressions from engineers declare it is worth a very great deal!

HH Enameled Slide Resistors are made with a straight narrow track left exposed on one side—then fitted with a sliding contact for the desired adjustment. Check off these points:

The *wire,* evenly wound, is embedded and protected in a hard, highly insulating and heat resistant vitreous enamel. The *shoe* cannot bend the wire, and in sliding it makes contact with the second turn before leaving the first. And HH Slide Resistors are available in *three types* with a full range of capacities.

Your request will bring detailed information immediately.

ENAMELED
HH SLIDE RESISTORS

HARDWICK-HINDLE, INC.
216 Emmet St., Newark, N. J.

Classified Index

MATERIALS, PARTS and EQUIPMENT

ON this and the following several pages is a monthly feature of ELECTRICAL MANUFACTURING, an alphabetically arranged classification of all materials, parts and equipment entering into the manufacture of the finished electrical product. Under each subject heading will be found the names of the manufacturers, local addresses and trade names of the products manufactured. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

A similar index of all finished electrical products for consumption or resale by wholesalers, contractors, contractor-dealers, central stations and industrial electricians, is a monthly feature of ELECTRICAL INSTALLATION RECORD.

ALLOYS, LIGHT METAL
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa Alumac. See Aluminum Co. of America.
Aluminum Co of America. 2444 Oliver Bldg., Pittsburgh.
Fairmont Aluminum Co., Fairmont, W. Va.

AMMETERS. See Instruments.

ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature
Bearings. See Bearings.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Impregnators, Vacuum. See Ovens, Industrial.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
New. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.

ARMATURE & COIL SPRAY GUNS. See Spraying Outfits.

ARMORING MACHINES. See Wire Manufacturing Machines.

ARMS, FLEXIBLE. See Tubing Flexible Metallic.

ASBESTOS
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferode & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., 292 Madison Ave., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa.
Deceleco, Inc., Wayne, Mich.
Electrobestos. See Johns-Manville Corp.
Ferode & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.
Transite. See Johns-Manville, Inc.
Zellite. See Deceleco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BAKELITE MOULDS. See Dies, Die Makers.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways)
Armature Coil Equip. Co., 2415 Forestdale Ave., Cleveland, O. (Machine).
Bowsher Co., N. P., South Bend, Ind.
Olsen Lundgren. See Olsen Testing Machine Co.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines).
Sundstrand Machine Tool Co., Rockford, Ill.
Twentieth Century. See Sundstrand Machine Tool Co.
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., 263 Chestnut Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.

BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
Anaconda. See American Brass Co.
American Brass Co., Waterbury, Conn.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Electric Materials Co., North East, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Homer Commutator Co., 4748 Hough Ave., Cleveland.
Rome Brass & Copper Co., Div. of Revere Copper & Brass, Inc., Rome, N. Y.

BASES, Radio Tube. See Radio Molded Parts.

BASES, Reading Lamp
Metal, Pottery, Wood & Glass.

NOLU OILLESS BEARINGS
WOOD IMPREGNATED

Adapted for high or low speed machinery. Never need oil. Increase output. Keeps materials free from soil through elimination of oil. "Thrive on Neglect." Samples on request. Write us.

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2 East Johnson St.
Germantown, Philadelphia, Pa.

American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., 602 E. 18th, Muncie, Ind.
Camar Pottery, Camden, Ark.
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Hemill Products, Inc., 103 Mott, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Wabash Ave., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS. Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Durco. See Struthers Dunn, Inc.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Aetna Ball Bearing Mfg. Co., Chicago, Ill.
Ahlberg Bearing Co., 312 E. 26th, Chicago, Ill.
American Roller Bearing Co., Pittsburgh, Pa.
Auburn Ball Bearings Co., 57 Clarissa, Rochester, N. Y.
Ball & Roller Bearing Co., Danbury, Conn.
Bantam Ball Bearing Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Commercial. See Schatz Mfg. Co.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearing Co., Poughkeepsie, N. Y.
Gurney. See Marlin-Rockwell Corp.
Gwilliam Co., 360 Furman, Brooklyn, N. Y.
Hoffman. See Norma-Hoffman Bearings Corp.
Hoover Steel Ball Co., Ann Arbor, Mich.
Hyatt Roller Bearing Div. of General Motors Corp., Harrison, N. J.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Gurney Ball Bearing Div., Jamestown, N. Y.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Nice Ball Bearing Co. (Nicetown), Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Whitehead Rd., Trenton,
Schatz Mfg. Co., Poughkeepsie, N. Y.
Schubert. See McGill Metal Co.
S R B. See Standard Steel & Bearings, Inc.
Standard Steel & &Bearings, Inc., Div. of Marlin-Rockwell Corp., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.
Zubler Bearings Co., 1321 W. Tioga, Philadelphia, Pa.

BEARINGS, Oil-Less
Arguie Oilless Bearings Co., 149 Berkeley, Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hopper, Inc., 225 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.

Ball and Socket Joint

INSULATORS
Ask for samples
STRUTHERS DUNN, INC.
134 North Juniper Street, Philadelphia, Pa.

Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., 880 E. 72nd, Cleveland, O
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., 1050 Nepperhan Ave., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Moraine Products Co., First & Foundry Sts., Dayton, O.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 2 E. Johnson (Germantown), Philadelphia, Pa.
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich.
Reliance. See Metal Saw & Machine Co.
Selb Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit, Mich.
Bunting Brass & Bronze Co., Toledo, Ohio.
Cadman Mfg. Co., G. W., Pittsburgh, Pa.
Damascus Bronze Co., Pittsburgh, Pa.
Durex. See Moraine Products Co.
Erie Bronze Co., 1832 Chestnut, Erie, Pa
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
Moraine Products Co., First & Foundry Sts., Dayton, O.
United States Graphite Co., Saginaw, Mich.

BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Dayton Rubber Mfg. Co., Dayton, O.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.
Todd Elect. Co., 914 Grand Ave., Kansas City, Mo.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

BENDING. See Punching & Bending.
BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Reading Elec. Co., Inc., 24 Frankfort, New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.

BLOCKS, Terminal. See Terminal Blocks.

BLOWERS, Armature
For Dusting Out Motors.
Big Midget. See Sturtevant Co.
Breuer Elec. Mfg. Co., 852 Blackhawk, Chicago, Ill.
Clements Mfg. Co., 609 Fulton, Chicago, Ill.
Cyclone Portable Electric Blower Co., 222 N. 12th, Philadelphia, Pa.
Electric Blower Co., 352 Atlantic Ave., Boston 9, Mass.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Marvel. See Electric Blower Co.
Sanitator. See United Elec. Co.
Cadillac. See Clements Mfg. Co.
Standard Elecl. Tool Co., 1939 W. Eighth, Cincinnati, O.
Sturtevant Co., B. F. (Hyde Park), Boston, Mass.
Tornado. See Breuer Elec. Mfg. Co.
United Elec. Co., 1230 8th, Canton, O.
United States Elecl. Tool Co., 2488 W. Sixth, Cincinnati, O.

BLUESTONE. See Chemicals, Battery.
BOARD, Fuller. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOMBARDING MACHINES. See Machines, Lamp Making.
BOWL HOLDERS. See Fixture Fittings.
BOX & CABINET BUSHINGS. See Bushings, Box & Cabinet.

BOX BOARD
Container Corp. of America, 111 W. Washington, Chicago

BOXES, Fibre
Container Corp. of America, 111 W. Washington, Chicago
BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Brown & Bailey Co., 417 N. Eighth, Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., 904 S. Main, South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, 111 W. Washington, Chicago
Gair Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 325 Decatur, Sandusky, Ohio.
Huntington Paper Box Co., Huntington, Ind.
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O (Display Cartons.)
National Folding Box Co., New Haven, Conn. (Cartons.)
Pequot Mfg. Corp., Glendale (L. I.), New York.
Pittsburgh Corrugated Paper Box Co., 1414 Spring Garden Ave., Pittsburgh, Pa.
River Raisin Paper Co., Monroe, Mich.
Shuttleworth Carton Co., 474 W. Broadway, New York.

BRACKETS, Instrument
For Suspending Meters to Station Switchboard.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

BRAIDING MACHINES. See Wire Manufacturing Machines.

BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
Anaconda. See American Brass Co.
American Brass Co., Waterbury, Conn.
American Nickeloid Co., Peru, Ill.
Baltimore Brass Co., 1212 Wicomico, Baltimore, Md.
Baltimore Copper Mills, Div. of Revere Copper & Brass, Inc., Baltimore, Md.
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Buffalo Bronze Die Cast Corp., 100 Arthur, Buffalo, N. Y.
Dallas Brass & Copper Co., Div. of Revere Copper & Brass, Inc., 820 Orleans, Chicago, Ill.
Durbar. See Buffalo Bronze Die Cast Corp.
Electric Materials Co., North East, Pa.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit, Fredericksen Co., Saginaw, Mich.
Higgins Brass & Mfg. Co., Div. of Revere Copper & Brass, Inc., 12435 Dequindre, Detroit, Mich.
Johnson Bronze Co., New Castle, Pa.
Michigan Copper & Brass Co., Div. of Revere Copper & Brass, Inc., 5851 W. Jefferson Ave., Detroit, Mich.
Nickeloid. See American Nickeloid Co.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sobeco. See Fredericksen Co.
Seymour Mfg. Co., Seymour, Conn.
Taunton-New Bedford Copper Co., Div. of Revere Copper & Brass, Inc., Taunton, Mass.
Titan Metal Mfg. Co., Bellefonte, Pa. (Rods and Forgings.)
Western Cartridge Co., East Alton, Ill.

BREAKERS, Circuit. See Circuit Breakers.

BRIDGES, Wheatstone. See Instruments, Laboratory Standard.

BRONZE. See Brass, Bronze and Copper; also Castings

BRONZE, Phosphor. See Phosphor Bronze.

BRONZE POWDER, Aluminum. See Aluminum.

BRUSH HOLDERS. See Brushes, Commutator.

BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See B
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W

Automotive Mfg. Co., Kansas City, Mo.					H	
B. B. B. See Becker Bros. Elec'l Corp.						
Baylis Co., Bloomfield, N. J.					H	
Becker Bros. Elec. Corp., 23 N. Jefferson, Chicago, Ill.	C	W	S	H		L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.	C					
Boxill-Bruel Carbon Co., Columbia, O.	C			H		
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa.	C					
Carbon Engrg. Co., Slinger, Wis.	C					L
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O.	C					
Carbon & Graphite Corp., 227 West Broadway, New York, N. Y.	C					
Carenco. See Carbon Engineering Co.						
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y.	C	W	S			L
Columbia Machine Wks., & M. I. Co., 261 Chestnut, Brooklyn, N. Y.					H	
Cooley Mfg. Co., 98 Park Place, New York		W				
Diamond C. See Chapin Co., Chas. E.						
Dixon Crucible Co., Monmouth St., Jersey City	C					
Electra. See Automotive Mfg. Co.						
Electric Accessories Co., 310 York Ave., Philadelphia, Pa.					H	
Electro-Nite Carbon Co., 508 N. Fourth, Philadelphia, Pa.	C					
Eureka Metal Products Corp., 91 Clay, North East, Pa.			W	S	H	
Fleck Carbon Co., 508 Broome, New York.	C	W				L
General Cable Corp., 420 Lexington Ave., New York, N. Y.			W			L
General Electric Co., Schenectady, N. Y.	C				H	
Graphalloy. See Graphite Metallizing Corp.						
Graphite Metallizing Corp., 1050 Nepperhan Ave., Yonkers, N. Y.	C			H		
Henrite Products Co., 98 Park Place, New York, N. Y.	C					
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio				H		
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa.	C					
Kohlenite Products Co., 92-34 152nd St., Jamaica, N. Y.	C					
Le Carbone Co., 15th St., Hoboken, N. J.	C					
Le Valley Vitae Carbon Brush Co., 4851 Grand Central Terminal, New York, N. Y.	C					
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.	C					
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y.	C					
National Carbon Co., Cleveland, O.	C					
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa.	C					L
No Spark. See Calebaugh Self-Lubricating.						
Ohio Carbon Co., 12508 Almira Ave., Cleveland, Ohio	C	W				L
Ohio Elec. Specialty Mfg. Co., Troy, O.		W				
Perfection Supply Co., 98 Park Pl., New York, N. Y.	C	W	S	H		L
Pittsburgh Carbon Brush Co., 801 Fulton, Pittsburgh, Pa.	C					
Pure Carbon Co., Wellsville, N. Y.	C	W	S			L
Pyramid. See National Carbon Co.						
Reactleo. See Baylis Co.						
Reading Elec. Co., Inc., 24 Frankfort, New York, N. Y.	C					L
Salem Electrical Supply Co., 285½ Bridge, Salem, Mass.		W				
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo.	C					
Speer Carbon Co., St. Mary's, Pa.	C					
Stackpole Carbon Co., St. Mary's, Pa.	C					
Sterling. See Carbon Laboratories Co.						
Superior Carbon Products Co., North Rd., Poughkeepsie, N. Y.	C					
U. S. Graphite Co., Saginaw, Mich.	C					
Universal. See Graphite Metallizing Corp.						
Weber Elec. Wks., Brooklyn Sta., Cleveland.	C					L

BRUSHES, PNEUMATIC SPRAYING. See Spraying Outfits, Sts.

BRUSHES FOR VACUUM CLEANERS
Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass
For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Corning Glass Wks., Corning, N. Y.

CUNCHING MACHINES. See Wire Manufacturing Machines.

BUS BAR. See Brass, Bronze and Copper. Also Aluminum.

BUSHINGS, SHAFT. See Bearings and Bushings.

BUSHINGS, Box and Cabinet, Porcelain
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill.
Columbia Metal Box Co., 226 E. 144th St., New York, N. Y.
Harter. See Multi Elecl. Mfg. Co.
Knox Porcelain Corp., Knoxville, Tenn.
Mineralac Electric Co., 1045 Washington Blvd., Chicago, Ill.
Multi Electric Mfg. Co., 1840 W. 14th Ave., Chicago, Ill.
Nelson Elec. Co., Plant City, Fla.

CABINET GRILL CLOTH See Cloth, Untreated.

CABINETS, Fibre
Continental-Diamond Fibre Co., Newark, Del.
Vulcawood. See Continental-Diamond Fibre Co.

CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel
Stamped and Turned-up Boxes and Cabinets
Acme Blow Pipe & Sheet Metal Wks., 713 Magazine, New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
All-Steel-Equip. Co., Aurora, Ill.
American Metal Wks., 4865 Stenton Ave., Philadelphia, Pa.
American Steel Furniture Co., 27 W. 24th, New York, N. Y.
Artisan Sheet Metal Corp., 53 Gorham, Rochester, N. Y.
Benjamin Elec. Co., W. A., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 551 W. Monroe, Chicago, Ill.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Chicago Hdwe. Foundry Co., North Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Coast Specialty Co., 73 E. Sixth, Portland, Ore.
Cole Electric Products Co., 33 Crescent, Long Island City.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Creiger Electrical Mfg. Co., 609 W. Lake, Chicago, Ill.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Apparatus Co., 704 N. Halsted, Chicago, Ill.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Holzer Sheet Metal Wks., Inc., 317 Burgandy, New Orleans, La.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Large-Dall Mfg. Co., 311 N. Tenth, Philadelphia.
Lexington Elec. Products Co., 12 Chapel, Newark, N. J.
Lorentzen, H. K., 155 Leonard, New York, N. Y.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Par-Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Rezioh. See Holzer Sheet Metal Works.
Robbins & Myers Sales, Inc., Springfield, O.
Security. See Aurora Steel Products Co.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 238 46th, Brooklyn, N. Y.
Superior Switchboard & Devices Co., 420 Schreyer Ave., Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Mail Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 316 Coit, Irvington, N. J.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wiegman & Co., E. M., 1908 Benton, St. Louis, Mo.
Wurlack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood
Accurate Molding Corp., 20 Morton, Brooklyn, N. Y.
Adler Mfg. Co., Louisville, Ky.
Adler Royal. See Adler Mfg. Co.
Ampere. See Donehue Lumber Co.
Art Woodworking Co., Inc., 1035 Seattle Blvd., Seattle.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Carlon. See Art Woodworking Co.
Carolina Wood Products Co., Asheville, N. C.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cary Cabinet Corp., 1427 N. 15th, St. Louis, Mo.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Chickasaw Furniture Mfg. Co., Memphis, Tenn.
Conrades Mfg. Co., 1943 N. Second, St. Louis, Mo.
Conner Furniture Co., New Albany, Ind.
Continental Radio Corp., East Pontiac, Extended, Fort Wayne, Ind.
Corbett Cabinet Mfg. Co., St. Mary's, Pa.
Cory Cabinet Corp., Springfield, Mo.
Defker Co., Geo., Henderson, Ky.
Ebert Furniture Co., 225 W. 24th, New York, N. Y.
Effelin & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excello Products Corp., 4836 W. 16th (Cicero), Chicago, Ill.
Federal Wood Products Corp., 206 Lexington Ave., New York, N. Y.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Hubbell, H. L., 59 Market Ave., N. W., Grand Rapids.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
Karpen. See Studner Bros.
King Mfg. Corp., 254 Rano, Buffalo, N. Y.
Klumpp Sons, John G., 12 Baxter, New York, N. Y.
Knoxville Table & Chair Co., Knoxville, Tenn.
National Cabinet Co., New Philadelphia, O.
New England Bed Co., Greenfield, Mass.
Ohio Valley Cabinet Co., Wheeling (Warwood), W. Va.
Oneida Cabinet Corp., Oneida, N. Y.
Ottawa Furniture Co., Holland, Mich.
Phono-End-Table. See Continental Radio Corp.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia
Radio Mfg. Co., Div. of Pilliod Lumber Co., Swanton, O.
Radio Master Corp., Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Showers Bros. Co., Bloomington, Ind.
Signal Elec. Mfg. Co., Menominee, Mich.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Starr Piano Co., Richmond, Ind.
Stettner Phonograph Corp., 669 Kent Ave., Brooklyn, N. Y.
Studner Bros., 37 W. 44th, New York, N. Y.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R. Trenton, N. J.
Udell Wks., 98th and Barnes Ave., Indianapolis, Ind.
Watsontown Table & Furniture Co., Watsontown, Pa.
West Box Co., 235 Liberty, Springfield, Mass.
Wood Cabinet Corp., 196 Lexington Ave., New York, N. Y.

CABLE ARMORING MACHINES. See Wire Manufacturing Machines

CABLE TEST SETS. See Instruments, Portable and Switchboard.

CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture
Glass, Fibre Paper.
Brandywine Fibre Products Co., 1402 Walnut, Wilmington.
Cleveland Container Co., 10619 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., 173 Lafayette, New York, N. Y.
Phoenix Glass Co., Monaca, Pa.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.
Universal Brass Wks., 209 Vine, Philadelphia, Pa.

CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.

CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.

CARBONS, Battery. See Cartons.
Arc Light. See Carbons.

CARBONS
Battery Arc Light.
Becker Bros. Elecl. Corp., 23 N. Jefferson, Chicago, Ill.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing. See Blanck & Carrier Corp.
Nuernberg. See Blanck & Carrier Corp.

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National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.
White Flame. See National Carbon Co.
CARTONS. See Boxes and Wrappers.
CASEIN PLASTICS. See Molded Insulation.
CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Brumberger Co., 252 Pearl, New York, N. Y.
Grand Sheet Metal Wks., 176 Grand, New York, N. Y
Karp Metal Products Co., 129 30th, Brooklyn.
Luna Metal Products Co., 38 Emerson Pl., Brooklyn, N. Y.

CASES, Flashlight

Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
CASTINGS, Aluminum. See Castings, Aluminum. Also
Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

American Aluminum Ware, 368 Jeliff Ave., Newark, N. J.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
Bergen Point Brass Foundry, Sixth & Ave A, Bayonne, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit, Mich.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y
Dick Bros., Inc., Reading, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Fairmont Aluminum Co., Fairmont, W. Va.
Monarch Aluminum Ware Co., 9301 Detroit Ave., Cleveland.
National Bronze & Aluminum Foundry Co., 88th & Lazy Cleveland O.
Quality Aluminum Casting Co., Waukesha, Wis.
Sterling Die Casting Co., 749 39th, Brooklyn, N. Y.
Tenual. See National Bronze & Aluminum Foundry Co
United Metal Mfg. Co., Inc., 25 Shipping, Norwich, Conn.
Veco Mfg. Co., South Norwalk, Conn.

CASTINGS, Die

Alemite Die-Casting & Mfg. Co., Woodstock, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Badger Die Casting Co., 155 Buffalo, Milwaukee, Wis.
Barnhardt Bros. & Spindler, Monroe & Throop St., Chicago.
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y
Franklin Die Casting Corp., 826 Gifford, Syracuse, N. Y.
Illinois Die Castings Co., 551 W. Congress, Chicago, Ill.
Krome-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
National Die Casting Co., 600 N. Albany Ave., Chicago.
Newton Die Casting Corp., 146 Munson, New Haven Conn.
Paragon Die Casting Co., 2701 N. Crawford Ave., Chicago.
Parker White Metal & Machine Co., Erie, Pa.
Permite. See Aluminum Industries, Inc.
Phoenix Die Castings Co., 21 Illinois, Buffalo, N. Y.
Pittsburgh Die Casting Co., 7508 Ardmore, Swissvale, Pa.
Precision Die Casting Corp., Syracuse, N. Y.
Republic Die Casting Co., 128 Mott, New York, N. Y.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.
Twin City Die Castings Co., Talmadge and 33rd Aves., S. E., Minneapolis, Minn. (White Metal).

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Fairmount Foundry, Inc., Third & Westmoreland Sts., Philadelphia, Pa.
Farquhar Co., Ltd., A. B., York, Pa.
Forest City-Walworth Run Foundries Co., 2500 W. 27th, Cleveland, O.
Gray Iron Foundry Co., Reading, Pa.
Laytham & Son Co., Wm. P. 889 Market, Paterson, N. J.
Milwaukee Grey Iron Foundry Co., 3910 Mitchell, Milwaukee, Wis.
North Lebanon Foundry Co., Second & Canal, Lebanon, Pa.
North Wales Mach. Foundry Co., North Wales, Pa.
Precinets Machine Co., Bridgeport, Conn.
Sachs Iron Foundry, L., 35" Wilson Ave., Newark, N. J
Sharples Separator Co., Biddle & Patten Ave., Westchester, Pa.
Snead & Co. Pine St., Jersey City, N. J.
Union Mfg. Co., New Britain, Conn.
Western Foundry Co., Kedzie Ave. at 36th, Chicago, Ill.

CASTINGS, Malleable Iron

Eastern Malleable Iron Co., Naugatuck, Conn.
St. Louis Malleable Castings Co., 7701 N. Conduit Ave., St. Louis, Mo.

CASTINGS, Non-Ferrous

Copper, Brass, Bronze, Monel Metal, White Metal.
Anderson Mfg. Co., Albert & J. M., 289 A Boston, Mass.
American Manganese Bronze Co., Holmesburg, Philadelphia.
Atlas Brass Foundry Co., Columbus, O.
Barnard Foundry Co., 9 Roseland, Springfield Mass.
Bergen Point Brass Foundry, Sixth & Ave A, Bayonne, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit, Mich
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N.
Buffalo Bronze Die Cast Corp., 100 Arthur, Buffalo, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Cadman Mfg. Co., A. W., Pittsburgh, Pa.
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Creamer & Co., W. G., 572 Smith, Brooklyn, N. Y.
Davis & Zuckerman, 514 E. 11th, New York, N. Y.
Delta Star Electric Co., 2437 Fulton, Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Erie Bronze Co., 1832 Chestnut, Erie, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Faries Mfg. Co. Decatur, Ill.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Harsch Bronze & Foundry Co., John, 11612 Madison Ave., Cleveland, O.
Johnson Bronze Co., New Castle, Pa.
Medill Metal Co., Valparaiso, Ind.
National Bronze & Aluminum Foundry Co., 88th & Lazy, Cleveland, O.
Ohio Pattern Wks. & Fdy. Co., 2730 Spring Grove Ave Cincinnati, O.
Rabun Bronze Foundry, 617 West Belgrave, Huntington Park, Cal.
Tenual. See National Bronze & Aluminum Foundry Co.
United Metal Mfg. Co., Inc., 25 Shipping, Norwich, Conn

CASTINGS, Steel

Bonney-Floyd Co., Marion Rd., Columbus, Ohio
Eastern Steel Casting Co., Ave. L & Edward St., Newark
Northwestern Steel & Iron Corp., 2907 Fourth, S. E., Minneapolis, Minn.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Proctan. See Northwestern Steel & Iron Corp.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J
Silver Steel Castings Co., Milwaukee, Wis.

CEMENT, Commutator

Anenoriute. See Technical Products Co.
Commutator Companion. See Withington Div. of Marnot Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Fixwick. See Technical Products Co.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.
Perco-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Porce-Lute. See Perfection Supply Co.
Technical Products Co., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
Withington Div. of Marnot Co., 50 Thayer, Boston, Mass.

CEMENT, Liquid Porcelain

Anchorlute See Technical Products Co
Color-Bestos. See Technical Products Co.
Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Patch-O-Namel. See Technical Products Co.
Repairet Mfg. Co., Milwaukee, Wis.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Technical Products Co., Pittsburgh, Pa.
Thermold. See Technical Products Co.
CHAIN, Chandelier (Fancy). See Crystals, Chandelier.
CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Chase Brass & Copper Co.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., Haggert & Emerald Sts., Philadelphia, Pa.
H. & O. Chain Co., Sc. Norwalk, Conn.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 290 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y

CHAIN, Power Transmission

Baldwin Chain & Mfg. Co., Worcester, Mass.
Boston Gear Wks. Sales Co., Norfolk Downs, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, 910 S. Michigan Ave., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Renold Boston. See Boston Gear Wks.
Union Chain & Mfg. Co., Sandusky, O.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket

American Ball Chain Works, 12 Wooster St., New York.
Read Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.
CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Luma Elec. Equipment Co., Toledo, O.
Scintilla Magneto Co., Inc., Sidney, N. Y.

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Plano, Ill.

Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electrex. See Goodyear Chemical Co., Inc.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co. Murray Rd. and Big Four R. R., (St. Bernard), Cincinnati, O.
Goodyear Chemical Co., Inc., 20 W. 22nd, New York, N. Y.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Lightning Co., St. Paul, Minn.
Merrimac Chemical Co., 148 State, Boston, Mass.
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltah. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration

Arctic. See Roessler & Hasslacher Chemical Co.
Calco Chemical Co., Bound Brook, N. J.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic

J & H Elec. Co., 200 Richmond, Providence, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Anderson Mfg. Co., Albert & J. M., 289 A St., Boston, Mass.
Asco. See Automatic Switch Co.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burkay, Inc., 30 Court, Newark, N. J.
Burke Controller Co., 869 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 842 Summer St. (South Boston), Boston Mass.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee. (Mercury Type).
Domestic Elec. Co., Kent, O.
General Electric Co., Section W-234, Bridgeport, Conn.
Hart & Hegeman Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hartman Electrical Mfg. Co., 31 E. Fifth, Mansfield, Ohio.
Heinemann Electric Co., Penn Ave. & Plum, Trenton, N. J.
High Tension Elecl. Specialty Co., 500 Washington, Abington, Mass.
Hitesco. See High Tension Elecl. Specialty Co.
H. & H. See Hart & Hegeman Div.
Inducto-Therm. See Allen-Bradley Co
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis (Oil Switches.)
Maple Co., R. H., 3156 Ruckle, Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Re-Cirk-It. See Heinemann Elec. Co.
Roller-Smith Co., 220 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 3510 36th Ave., Long Island City, N. Y.
Time-O-Stat Controls Co., Elkhart, Ind.
T-Re-Lite. See I. T. E. Circuit Breaker Co
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
CIRCUIT TESTERS. See Testers, Fuse and Circuit
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal

Oakite Products, Inc., 26 Thames, New York, N. Y.
CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug

Gray Bros., Inc., Plano, Ill.
CLOCK SWITCHES. See Switches, Time.
CLOTH GEARS. See Gears and Pinions, Composition.
CLOTH LOUD SPEAKER DIAPHRAGM. See Cloth, Untreated.
CLOTH RADIO GRILL. See Cloth, Untreated.

CLOTH, Untreated

Boyle & Co., John, 112 Duane, New York, N. Y.
Canvas, "Aeroplane Cloth," Cotton Duck, Drill, Diaphragm Cloth, Grill Fabrics, etc
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y
Pindall Fabrics Corp., 200 Madison Ave., New York, N. Y.
(Grill Cloth)
Walker Cotton Fabrics Co., 327 S. La Salle, Chicago, Ill.

CLOTH, WIRE

(For Radio Tube Screens)
Buffalo Wire Works Co., 588 Terrace, Buffalo, N. Y.

CLOTH AND PAPER, Insulating

Cloth, Insulated ..... See C
Paper, Insulated ..... See P
Fibre Paper (Fish Paper) ..... See F
Press Board (Fuller Board) ..... See B
Silk ..... See S
Acme Wire Co., New Haven, Conn. ..... C S P
Armco. See Rogers Paper Mfg. Co.
Armatite. See Mica Insulator Co.

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Behr-Manning Corp., Troy, N. Y. ..... P
Brand & Co., Wm., 268 4th Ave., New York ..... P
Campbellite. See National Vulcanized.
Carboloid Products Corp., 98 Front, Brooklyn, N. Y. ..... C P
Case Brothers, Inc., Highland, Farm, Conn. ..... P
Case Mfg. Co., Unionville, Conn. ..... P
Case & Risley Press Paper Co. Oneco, Conn. ..... P
Cellma. See Tarentum Paper Mills Co.
Celoron Co., Div. of Continental Diamond Fibre Co., Bridgeport, Pa. ..... P F B
C-F. See National Vulcanized Fibre Co.
Columbian Rope Co., Auburn, N. Y. ..... P
Continental-Diamond Fibre Co., Newark, Del. ..... P
Consumers Rubber Co., 1302 Ontario, N., Cleveland, O. ..... P
Coruco. See Consumers Rubber Co.
De Jonge & Co., Louis, 69 Duane, New York, N. Y. (Condenser) ..... P
Dexstar. See Dexter & Sons.
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.) ..... P
Dielectric Mfg Co., St. Louis, Mo. ..... C S P
Electra. See Tarentum Paper Mills Co.
Electrite. See West Virginia Pulp & Paper Co.
Fyberoid. See Wilmington Fibre Specialty Co.
General Electric Co., Merchandise Dept., Bridgeport, Conn. ..... C P
chandise Dept., Bridgeport, Conn. ..... C P
Hartford City Paper Co., Hartford City, Ind. (Glassine Condenser Tissue).
Hewitt & Bros., C. B., 16 Ferry, New York ..... C P
Hi-Tex See Stevens Paper Mills.
Hollingsworth & Vose Co., 333 Washington, Boston, Mass. ..... P
Incella. See Tarentum Paper Mills Co.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y. ..... F
Manning Paper Co., J. A., Troy, N. Y. ..... B
Mica Insulator Co., 200 Varick, New York C S P B
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. ..... C S P F B
National Vulcanized Fibre Co., Wilmington, Del. ..... F
New Jersey Wood Finishing Co., Amboy Ave., Woodbridge, N. J. C
Ohmoid. See Wilmington Fibre Specialty Co.
Old Hick. See Hewitt & Bros., C. B.
Peerless See National Vulcanized Fibre Co.
Riegel Paper Corp., 342 Madison Ave., New York, N. Y. ..... P
Rogers Paper Mfg. Co., So. Manchester, Conn. ..... B
Schweitzer, Inc., Peter J., 200 Fifth Ave. New York, N. Y. (Condenser Tissue.)
Stco. See Standard Insulation Co.
Spaulding Fibre Co., Tonawanda, N. Y. ..... F
Standard Insulation Co., East Rutherford, N. J. ..... C S P
Sterling Fireboard Co., 501 Fifth Ave., New York (Varnished Hard Fibreboard) ..... B
Sterlite. See Sterling Firebrand Co.
Stevens Paper Mills, Windsor, Conn. ..... B
Tarentum Paper Mills Co., Tarentum, Pa. ..... P
Turbonite. See Brand & Co., Wm.
Union Mills Paper Mfg. Co., New Hope, Pa. ..... P
West Virginia Pulp & Paper Co., 230 Park Ave., New York ..... B
Wilmington Fibre Specialty Co., Wilmington, Del. ..... P

CLUTCHES, Magnetic
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis

COIL (Coils).
Armature and Field. See Coils, Finished.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Impregnators, Vacuum. See Ovens, Industrial.
Induction. See Coils, Finished; also Electro-Therapeutic
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature and Field.
Tamping Tools. See Tools, Coil Tamping.
Taping Machines. See Taping Machines, Coil.
Testers. See Testers, Coil; also Test Benches, Armature
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Induction Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire

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Anderson & Co., C. J., 213 W. Austin Ave., Chicago, Ill.
Armature Co., 7500 Stanton, Cleveland, Ohio
Auth Electrical Specialty Co., 422 E. 53rd St., New York.
A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Bunnell & Co., J. H., 215 Fulton, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y
Concourse Electric Co., 294 E. 137th, New York, N. Y.
Cote Coil Div. of Universal Winding Co., Providence, R. I.
Ditmar Elec. Co., Brookline, Mass.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5903 Carnegie Ave., Cleveland, O
Electric Valve Mfg. Co., 64 Murray, New York, N. Y.
Electrical Coil Winding Co., 2735 Saunders, Camden, N. J.
Fredericks Co., H. M., 1315 S. Wabash Ave., Chicago, Ill.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
Globe Technolian Corp., Reading, Mass.
Herald Electric Co., 29 East End Ave., New York, N. Y
Ines Mfg. Co., Fort Wayne, Ind.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Mignon Elec. Corp., 909 Genesee, Buffalo, N. Y.
National Elec. Corp., 226 High, Newark, N. J.
Palmer Corp., Chas., 766 Broad, Newark, N. J. (Solenoids.)
Polymet Mfg. Corp., 829 E. 134th St., New York, N. Y.
Power Transformer Co., 145 W. 22nd, New York, N. Y.
Reliner Mfg. Co., W. B., Hagerstown, Md.
Robertson-Davis Co., 363 W. Superior, Chicago, Ill.
Robertson, Lee F., Inc., 532 West 22nd St., New York.
States Co., 19 New Park Ave., Hartford, Conn.
Stuna & Barron, 210 E. Pratt, Baltimore, Md.
Toledo Standard Commutator Co., 2241 Spread Ave., Toledo, O.
Universal Armature Corp., Cambridge, Mass.
Varley Duplex Magnet Co., 15 Exchange Place, Jersey City, N. J. (Electromagnetic only).
Wheeler Insulated Wire Co., Bridgeport, Conn.

COMMUTATOR
Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS
Armature Co., 7500 Stanton Ave., Cleveland, Ohio.
Cameron Electric Mfg. Co., Ansonia, Conn
Cleveland Commutator Co., 1882 E. 55th, Cleveland, O.
Derby Commutator Co., Derby, Conn.
Electric Materials Co., North East, Pa.
Eureka Metal Products Corp., 491 Clay, North East, Pa.
Homer Commutator Co., 4748 Hough Ave., Cleveland.
Toledo Standard Commutator Co., Toledo, O.

COMMUTATOR BRUSHES. See Brushes Commutator.

COMPOSITION PULLEYS. See Pulleys, Composition.

COMPOUNDS, Commutator
Allen Co., Inc., L. B., 6752 Bryn Mawr Ave., Chicago, Ill.
Armstrong. See Elec. Power Maintenance.
Chicago Solder Co., 4201 Wrightwood Ave., Chicago, Ill.
Consolidated. See Warren Lubricant Co.
Cramolin, Inc., 25 W. 43rd St., New York, N. Y.
Dixon Crucible Co., Jos., Monmouth, Jersey City, N. J.
Doe & Co., Walter S., Kent, Ohio.
Electric Power Maintenance Co., 21 N. Third, Minneapolis
Goldmark Co., James, 83 Warren, New York, N. Y.
Kester Solder Co., 4201 Wrightwood Ave., Chicago, Ill.
Perfection. See Warren Lubricant Co.
Sanderson. See Warren Lubricant Co.
Spermo. See Warren Lubricant Co.
Trotters. See Goldmark Co., James.
Warren Lubricant Co., 22 Maurice, Buffalo, N. Y.

COMPOUNDS, Sealing. See Wax and Compounds.

CONDENSER UNITS, Refrigerator
Bush Mfg. Co., Hartford, Conn.
McCord Radiator & Mfg. Co., Rionelle & E. Grand Ave., Detroit, Mich.
Rome-Turney Radiator Co., Rome, N. Y.
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.

CONDENSER, Electric
Sevison Magneto Engineering Co., 379 Phillips Ave., Toledo,

CONDENSERS, Radio. See Radio Circuit Components

CONDENSER TUBING. See Tubing, Brass and Copper

CONNECTORS, Wire
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill. (Solderless-Tapeless).

CONTACT POINTS. See Points, Contact.

CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor
Arlinestor See Sundh Elec. Co
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Anderson & Co., C. J., 213 W. Austin Ave., Chicago, Ill.
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York, N. Y
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burkau, Inc., 30 Court, Newark, N. J.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., 324 S. California Ave., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd Cleveland, O.
Condit Elec'l Mfg. Corp., 842 Summer (South Boston) Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee
Diamond Elecl. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
Dinkey. See Elec. Controller & Mfg. Co.
Dunco. See Struthers Dunn, Inc.
E C & M Youngstown. See Electric Controller & Mfg. Co
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
Hercules. See Union Elec. Mfg. Co.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 515 Greenwich, New York.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Maimin Speed Control Corp., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd., Chicago, Ill.
Resista. See Allen-Bradley Co.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md
Square D Co., Detroit, Mich.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Switchslone. See Condit Elec. Mfg. Co.
Thermaload See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn

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379-401 Phillips Ave. Toledo, Ohio

Ward Leonard Elec. Co., 31 South, Mount Vernon, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
W. K. See Westinghouse Elec. & Mfg. Co.
Wright. See Electric Controller & Mfg. Co.
COPPER. See Brass, Bronze and Copper; also Castings
COPPER TUBING. See Tubing, Brass and Copper.
CORD TIPS. See Tips, Cord.
CORD, Tinsel. See Tinsel Cord & Thread.

CORDS, Extension
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

CORES, RESISTANCE COIL (Lava)
American Lava Corp., 1425 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Ee-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)
American Lava Corp., 1425 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Crowley & Co., Henry L., 1 Central Ave., West Orange, N. J.
Electrical Refractories Co., 50 Clark, East Palestine, O.
Klemite. See Louthan Mfg. Co.
Firelite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y
Vitreoil. See Thermal Syndicate.

COTTON DUCK. See Cloth, Untreated.

COTTON SLEEVING. See Tape, Cotton.

COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett Hayward Co., Scott & McHenry, Baltimore, Md.
Bond Co., Charles, 617 Arch, Philadelphia, Pa.
Brown Engineering Co., 123 N. Third, Reading, Pa.
Falk Corp., Milwaukee, Wis.
Delbee Rubber Co., Syracuse, N. Y.
Francke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Grundy. See Bond Co.
Hill Clutch Machine & Foundry Co., 6400 Breakwater Ave., Cleveland, Ohio.
Kanti Lever. See Brown Engineering Co.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Lovejoy Tool Wks., 325 W. Ohio, Chicago, Ill.
L.R. See Lovejoy Tool Wks.
Mather. See Bond Co.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 5 Halsey, Newark, N. J.
Webster Mfg. Co., 1856 N. Kostner Ave., Chicago, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.

COVERING MACHINES, WIRE. See Wire Manufacturing Machines.

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For Lamp Shades, Paper & Fabric, Fans, Radio & Appliances.
Adjusto. See Phoenix Import Co.
Arkel Safety Bag Co., 10 E. 40th St., New York, N. Y. (For Motors, Fans, Lamp Shades.)
Boyle Co., John, 121 Duane, New York, N. Y. (Fan.)
Droutman Mfg. Co., 38 W. 60th, New York, N. Y.
Empire Shield Co., 500 Broadway, New York, N. Y.
Kennedy Car Liner & Bag Co., Shelbyville, Ind.
Lansing Sales Co., 24 Harvard, Boston, Mass.
La Rose Mfg. Co., 757 Sixth Ave., New York, N. Y. (Rubberized Fan.)
Phoenix Import Co., 45 E. 25th, New York, N. Y. (Shade.)
Superb. See Droutman Mfg. Co.
Superior. See Empire Shield Co.

CRUCIBLES, Porcelain. See Porcelain.

CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier
Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Fealite. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschberg, Shutz & Co., 268 4th Ave., New York, N. Y (Fringes.)
Nelson Read Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 44th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.

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Tucker, Inc., W. W. & C. F., 618 Capital Ave., Hartford, Conn.

CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA
Meyercord Co., Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y

DIALS
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

DIALS, Enameled
Cooper Oven Thermometer Co., Pequabuck, Conn.

DIAPHRAGM, Cloth. See Cloth, Untreated.
DIE CASTINGS. See Castings, Die.

DIE CASTING MACHINES
Allied Die Casting Corp., Long Island City, N. Y.
Madison-Kipp Corp., 211 Waubesa, Madison, Wisc.

DIE MAKERS. See Dies, Die Makers.

DIE SETS
Baumbach Mfg. Co., 1810 Kilbourn Ave., Chicago, Ill.
Danly Machine Specialties, Inc., 2104 S. 52nd Ave., Chicago, Ill.
Diamant Tool & Mfg. Co., 401 Mulberry, Newark, N. J.

DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS
Bower Mfg. Co., 625 N. Third, Newark, N. J.
Caldbeck Tool & Mfg. Co., 307 East Third, Des Moines, Iowa.
Chicago Molded Products Co., 2148 Walnut, Chicago, Ill.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Madison-Kipp Corp., 211 Waubesa, Madison, Wis.
Mareck & Nebel, 255 Greenwich, New York, N. Y.
Stein & Co., Wm. P., 424 St. Paul, Rochester, N. Y.

DIMMER, Theatre
Ward Leonard Elec. Co., 31 South, Mount Vernon, N. Y.

DISCS, Armature
Steel Discs, Laminations, and Segments for Motors and Transformers.
American Stamping Co., 978 E. 64th, Cleveland, O.
Armature Co., 7500 Stanton Ave., Cleveland, O.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y
Johnson, H. D., 170 Mahncke Court, San Antonio, Texas
Niagara Machine & Tool Wks., 637 Northland, Buffalo
Valley Appliances, Inc., 634 Lexington Ave., Rochester N. Y.
Willor Mfg. Corp., 117 Mercer, New York, N. Y.

DRAWING MACHINES, WIRE. See Wire Drawing Mach.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. Schenectady
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.

ELECTRODES FOR GAS SIGNS
American Neon Sign Corp., 549 W. 132nd St., New York.
American Sign Co., Cincinnati, Ohio.
Eisler Electric Corp., 770 S. 13th St., Newark, N. J.
G. R. S. De Vry Corp., 323 N. Michigan Ave., Chicago.

ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.

ELECTRO MAGNETS
Varley Duplex Magnet Co., 15 Exchange Pl., Jersey City, N. J.

ELEMENTS. Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)
(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper & Hartley, Inc., 335 Chandler, Worcester, Mass

ENGRAVING MACHINES
Portable Bench and Pedestal Outfits for Marking Metal.
Deckel See Preis & Co. Inc. H. P.
Eisler Electric Corp., 770 S. 13th, Newark, N. J.
(Tube Base Branders)
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Luma Elec. Equipment Co., Toledo, O.
Preis & Co., Inc., H. P. 227 Fulton, New York, N. Y.
Schmidt, Inc., Geo. T. 4102 Ravenswood Ave., Chicago, Ill.
Simplex Tool Co., Woonsocket, R. I.

ENGRAVING, Radio Panel
Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
General Fabricating Co., 165 Greenwich, New York, N. Y.

Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Mechanical Engraving Co., 130 Orchard, Newark, N. J.
Preis & Co., Inc., H. P., 227 Fulton, New York, N. Y.
Schmidt, Inc., Geo. T., 4102 Ravenswood Ave., Chicago, Ill. (Tube Base Branders).
Schwenks Machine Engraving Co., 2036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 4614 Spring Grove Ave., Cincinnati
Wright Radio Co., 114 Exchange, Rockland, Mass.

ESCUTCHEONS. See Radio Mountings.

EYELETS
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn.
Waterbury Button Co. (Elecl. Mfg. Dept.), Waterbury, Conn.

FABRIC, Radio Grill. See Cloth, Untreated
FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan
FAN GUARDS. See Forms, Wire.

FEET, Felt
Brawley Felt Co., Inc., T. R., 279 20th, Brooklyn, N. Y.
Mattatuck Mfg. Co., Waterbury, Conn.

FELT
American Felt & Cutting Co., 609 W. Lake, Chicago, Ill.
American Felt Co., 315 Fourth Ave., New York, N. Y.
Booth Felt Co. 460 18th, Brooklyn, N. Y.
Brawley Felt Co., Inc., T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4029 Ogden Ave., Chicago, Ill.

FERRULES
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, 400 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Monowatt Elec. Corp., 2 W. 40th, New York, N. Y.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Riadon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co. (Elecl. Mfg. Dept.), Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)
Container Corp. of America, 111 W. Washington, Chicago. Chicago, Ill.

FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol
Moisture Proof: Sheet, Rod, Tubes.
Alco. See American Insulator Corp.
Armite. See Spaulding Fibre Co.
Bakelite-Dilecto. See Continental Fibre Co.
Conite. See Continental-Diamond Fibre Co.
Continental-Diamond Fibre Co., Newark, Del.
Electrical Insulation Corp., 308 W. Washington, Chicago, Ill.
Formica Insulation Co., 4632 Spring Grove Ave., Cincinnati, O.
Franklin Fibre Specialty Co., Wilmington, Del
Laminated Phenol, Inc., 1228 S. Western Ave., Chicago, Ill.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Tonawanda, N. Y.
Synthane Corp., Oaks, Pa.
Textolite. See Electrical Insulation Corp.
Vul-Cot. See National Vulcanized Fibre Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

FIBRE, Vulcanized
Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cheats, Screw Machine Products.
Armite. See Spaulding Fibre Co.
Brandywine Fibre Products Co., 1402 Walnut St., Wilmington, Del.
Conite. See Continental-Diamond Fibre Co.
Continental-Diamond Fibre Co., Newark, Del.
Diamond F. See Continental-Diamond Fibre Co.
Delaware Hard Fibre Co., Box 970M, Wilmington, Del.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Pantasote Co.
Fibre Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., Wilmington, Del.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Iten Fibre Co., 5403 Bower Ave., Cleveland, O.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del
Ohmold. See Wilmington Fibre Specialty Co.
Pantasote Co., Inc., 250 Park Ave., New York, N. Y.
Peerless. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass
Vul-Cot. See National Vulcanized Fibre Co.
Vulcswood. See Continental-Diamond Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp
Cohn, Sigmund, 44 Gold, New York, N. Y.
Eisler Electric Corp., 770 S. 13th St., Newark, N. J.
Filament Supply Co., 1317 Willow Ave., Hoboken, N. J.
Gilbe Wire Co., Riverside Ave., Newark, N. J.
National-Harris Wire Co., Newark, N. J.
Pierce Mfg. Co., 625 W. Jackson Blvd., Chicago, Ill.
Radio Products Corp., Steneck Trust Bldg., Hoboken, N. J
Volkmer Radio Products Corp., 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)
Welcon Industries, Inc., Exton Ave. & Buch, North Arlington, N. J. (Lead-in Welds.)

FILES, Commutator Slotting
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.

FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.

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FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps . . . . . H
American Chain Co., Bridgeport, Conn. (Loops and Rings.) . . . . . B . . . .
American Ring Co., Waterbury, Conn. (Candle.) . . . . S . .
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. . . . . B I . . .
Arco. See American Ring Co.
Arrow Electric Division of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . . . S . .
Artoloid. See Great Eastern Brass Wks., Inc.
Art Metal Co., 3721 Dayton, Cleveland, O. . . . . H
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit. . B . . . . .
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 88 Walker, New York . . . . . B . . . . .
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. B . . . . .
Braun, J. G., 609 S. Paulina, Chicago, Ill. (Pressed Ornaments.) . . . . . B I . .
Bryant Elec. Co., 1421 State, Bridgeport, Conn. . . . S . .
B. & L. Metal Stamping Co., 250 Moore, Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) . . . . . B I . . H
Cambridge Brass Co., Cambridge, Mass. . . . . B . . . . .
Chase Brass & Copper Co., Waterbury, Conn. B . . S . .
Chatham Metal Spinning & Stamping Corp., 128 Mott, New York, N. Y. . . . . B I . . .
Cleanezy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J . . . . . B . . S . .
Crescent Brass Mfg. Co., Spruce & Seventh, Reading, Pa. . . . . B . . . . .
Crouse-Hinds, Syracuse, N. Y. . . . . S H
Diamond Needle & Mfg. Co., Torrington, Conn (Hickies) . . . . . I . . . .
Dunlap Co., John. Hammond & Gregg, Carnegie, Pa. . . . . S . .
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. . . . . B . . . . .
Eureka Tin Ware Mfg. Co., 135 W. 20th, New York, N. Y. . . . . S . .
E-Z Tip. See Plume & Atwood Mfg. Co.
Faries Mfg. Co., Decatur, Ill. . . . . B I S H
Fixturelite Mfg. Co., 468 W. Broadway, New York, N. Y. . . . . B . . . H
Flaherty Co., M. E., 28 S. Clinton, Chicago. . . . I . . .
Fralick Co., S. R., 15 S. Clinton, Chicago. . . . I . . .
Franklin Brass Foundry Co., Reading, Pa. . . . B . . . . .
Friedley-Voshardt Co., Chicago. . . . . B . . . . .
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O. . . . . I . . .
Great Eastern Brass Wks., Inc., 182 Grand, New York, N. Y. (Composition Spindles).
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . . . S . .
Hiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Liberty Brass Turning Co., 88 Walker, New York, N. Y. . . . . I . . .
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. . . . . B I . . .
Liberty Machine Co., Wauwatosa, Wis. . . . . B I . . .
L & K Mfg. Co. 440 Adelphi, Brooklyn, N. Y. . . . . H
L & W. Brass Wks., 361 W. Superior, Chicago. B . . . . .
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. . . . . I . . .
Melaun Mfg. Co., 144 E. Morris, Indianapolis, Ind. . . . . B . . . . .
Meta. Products Co., 210 Canal, New York. . . . B . . . . .
Metro Iron Ornament Co., 191 Christie, New York, N. Y. . . . . I . . .
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. . . . . B . . . .
Midwest Elec. Co., 1639 Walnut, Chicago, Ill. . . . I . . .
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. . . . . B . . . . .
Monarch. See Perfeclite Co.
Murlin Mfg. Co., 5420 Paschall Ave., Philadelphia, Pa. . . . . B I . . .
National Electric Products Corp., Pittsburgh, Pa. (Studs.) . . . . . I . . .
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. . . . . H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y. . . . . B . . . . .

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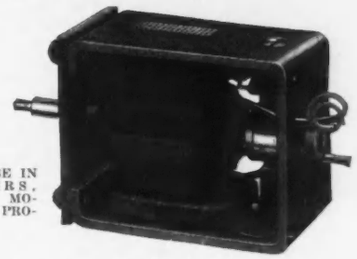

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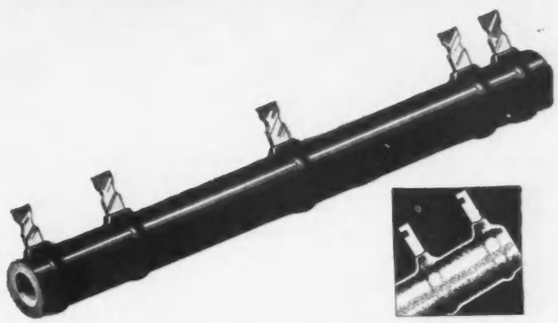

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Nobolt. See Fralick & Co., S. B.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. ..... I . . . .
Onli. See Perfecilite Co.
Pass & Seymour, Div. H, Solvay Sta., Syracuse, N. Y. ..... B . . S .
Perfecilite Co., 1457 E. 40th, Cleveland..... S .
Pittsburgh Valve & Fittings Co., Barberton, O. . . I . . .
Plume & Atwood Mfg. Co., Waterbury, Conn. B . . S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Products Machine Co., Bridgeport, Conn..... B . . . .
Reading Brass Co., 141 Schiller, Reading, Pa. B I . . .
Ribeyrac Mfg. Co., J., 952 W. Lake, Chicago, Ill. B . . . .
Roanle Mfg. Co., 200 Hudson, New York.... B . . . H
Scovill Mfg. Co., Waterbury, Conn..... B I . . .
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Springfast. See Plume & Atwood Mfg. Co.
Square-Gee. See Grabler Mfg. Co.
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. ..... S . .
Standard Metal Spinning Co., 128 Mott, New York, N. Y. ..... B . . . .
Star. See Perfecilite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., 1207 Columbus Ave., Pittsburgh, Pa. ..... I . . .
Steele & Johnson Mfg. Co., Waterbury, Conn. B . . S .
Stembridge & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.)..... B . . . .
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T & B. See Thomas & Betts Co.
Thomas & Betts Co., 15 Park Pl., New York.. . . I . . .
Line. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & K Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y ..... B . . . .
Universal Brass Wks., 209 Vine, Philadelphia. B . . . .
Vester, Sons, Alfred, 3 Mason, Providence, R. I. B
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O..... B . . . .
Walden Tool & Metal Mfg. Co., New Haven Conn. .....
Wameco. See Waterbury Metal Wares Co.
Waterbury Metal Wares Co., Waterbury, Conn. . . . S .
Weber Brass Co., Whitney Power Block, Cleveland, O. ..... B . . . .
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 79 Madison Ave., New York, N. Y..... B . . S . .
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal. ..... B . . . .

FLASHERS, Sign

Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.

Ajax. See Reynolds Spring Co.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 280 Guttenberg, San Francisco
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Consolidated Elec. Sign Corp., Opalume Div., 99 West Main Battle Creek, Mich.
Diamond. See General Appliance Corp
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electric Signal Corp., 405 Fourth Ave., Seattle, Wash.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal (Fisher Button.)
General Kontrolar Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Harrington-Seaberg Corp., 1708 Third Ave., Moline, Ill
Horni Signal Mfg Co., 516 Greenwich New York, N Y
Hotchkiss. See Time-O-State Controls Co.
Jimbetts. See Betts, Inc., James H
Kontrolar. See General Kontrolar Co. & Leland Elec. Co.
Leland Electric Co., Dayton, O.
Mercury. See Betts, Inc., James H.
Phelps Elec. Co., 79 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y.
Presto Products Co., 520 Broadway, New York, N. Y. (Sockets and Plugs.)
Reco. See Reynolds Elec. Co
Reynolds Elec. Co., 2622 W. Congress, Chicago, Ill.
Reynolds Spring Co., Jackson, Mich.
Rodale Mfg. Co., 200 Hudson, New York, N. Y
Ryan. See Phoenix Products Co.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp
Time-O-State Controls Co., Elkhart, Ind.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York N Y
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

FLASHLIGHT LENSES. See Lenses.

FLEXIBLE ARMS. See Tubing, Flexible Metallic.

FLEXIBLE LEADS, Commutater Brush. See Brushes, Commutator.

FLEXIBLE SHAFTING

Binghamton Flexible Shaft Co., 239 Water, Binghamton, N. Y.
Chicago Flexible Shaft Co., 5540 W. Roosevelt Rd., Chicago, Ill.
Haskins Co., R. G., 4636 W. Fulton, Chicago, Ill.
Stow Mfg. Co., 443 State, Binghamton, N. Y.
Strand & Co., N. A., 5001 N. Lincoln, Chicago, Ill.

FOIL, Tin. See Tin Foil.

FORGINGS, Non-Ferrous

Rome Mfg. Co. (Div. of Revere Copper & Brass, Inc.), Rome, N. Y. z z z z z z z z
Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co

FORMS, Wire

Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.

American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 206 E. 27th, New York, N. Y.
Blake & Johnson Co., 1497 Thomaston Ave. (Waterville), Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
City Wire Frame Co., 2025 S. Michigan Ave., Chicago.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Humason Mfg. Co., Forestville, Conn.
Hunter Pressed Steel Co., Lansdale, Pa.
Idealite Lamp Shade Mfg. Co., 49-55 Fremont, Jersey City, N. J.
Jenkinson & Co., R. C., 293 Washington, Newark, N. J.
Jordine Wire Specialty Wks., Crawfordsville, Ind.
Krischer's Mfg. Co., 255 Calyer, Brooklyn N. Y.
Manhattan Wire Products Co., 398 First Ave., New York
Mattatuck Mfg. Co., Waterbury, Conn.
Murray Hill Wire Frame Co 314 e. 42nd New York N
No-Draft Fan Fixture Co., 1703 Builder Bldg., Chicago, Ill. (Fan Guard.)
Protectafan Co., 6152 Delmar Blvd., St. Louis, Mo. (Fan Guard.)
Roebling's Sons Co., John A., Trenton N J
Russell Mfg. Co., John M., Naugatuck, Conn.
Seelsen & Co., 297 Washington, Newark, N. J.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.

FRAMES, Wire. See Forms, Wire.

FRICTION TAPE. See Tape, Rubber and Friction.

FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS

Sherman Mfg. Co., H. B., Battle Creek, Mich.
Waterbury Brass Goods Co., Waterbury, Conn.

FUSE PLUG SCREW SHELLS. See Shells, Screw Socket.

FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

KEY

Cartridge ..... See C
Plug ..... See P
Non-Refillable ..... See N
Refillable ..... See R
Open Link ..... See O
Fuse Wire ..... See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J..... P . . . . .
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa. ..... O
Arkless. See Economy Fuse Mfg. Co.
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa..... P . . . . .
Bryant Elec. Co., 1421 State, Bridgeport, Conn.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis ..... C P N R O
Chase-Shawmut Co., Newburyport, Mass... C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colortop. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ..... C . . N R . .
Commercial Enclosed Fuse Co., 1317 Willow Ave., Hoboken, N. J..... C P N . . .
Coto Bros. Mfg. Co., 182 W. Lake, Chicago C P . . R . .
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hedgkiss, Pittsburgh ..... C . . . R . .
D. & W. See Graybar Electric Co.
Eagle Electric Mfg. Co., Inc., 49 Hall. Brooklyn, N. Y..... P . . . . .
Economy Fuse & Mfg. Co., 3717 Greenview Ave., Chicago, Ill..... C P N R . .
Electric Fuseguard Co., Charlottesville, Va.. C P N R . .
Elliott Electric Co., Shreveport, La..... . . . . .
Gem. See Jefferson Elec. Co.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... C P N R . .
Graybar Electric Co., New York, N. Y..... C . . . . . .
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y..... R . .
H. & H. See Hart & Hegeman.
Hudson Wire Co., Ossining, N. Y..... O
Jefferson Electric Co., 1500 S. Laflen, Chicago, Ill. ..... C P N R O
Kearsark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y..... C P N . . O
Monarch Fuse Co., 116 E. First, Jamestown, N. Y. ..... C . . N R . .
National. See Economy Fuse & Mfg. Co.
Neark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 77 E. Swan, Buffalo, N. Y. ..... C P . . R . .
Platt Bros. & Co., Waterbury, Conn..... O
Powell, F. W., 119 W. Ohio, Pittsburgh.... P . . R . .
Pyrotite. See Bryant Electric Co.
Ree-Nu-It Elec. Co., New Bedford, Mass.. C P . . R . .
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y..... C . . . R . .
Royal Elec. Co., Chelsea Station, Boston... P N . . .
Seco. See U. S. Electric Co.
Shawmut. See Chase-Shawmut Co.
Simplex. See Powell, F. W.
Six-in-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P . . R . .
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee ..... C P N R .
Union. See Jefferson Elec. Co.
U.S. Electric Co., 18 Chambers, Trenton, N.J. . . P . . . . .

GALVANIZING

Cattie & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.

GALVANOMETERS. See Instruments, Laboratory Standard.

GAS, Inert

Helium Co., Louisville, Ky.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Weber, Alfred, 5 Union Square, New York, N. Y.

GAS SIGN ELECTRODES. See Electrodes for Gas Signs.

GASKETS.

See also Washers, Non Metallic; Fiber.

Bosley Co., D. W., 906 Marquette Bldg., Chicago, Ill.
Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Garfield Rubber Co., Bridgeport, Conn
Wrigley Bros., 356 W. 18th, New York, N. Y.

GAUZE BRUSHES, Wire. See Brushes, Commutator.

GEARS, Fibre. See Gears and Pinions, Composition.

GEARS (Speed Changing Units)

Albro-Clem Elevator Co. and Atlantic Elevator Co., 501 E. Erie Ave., Philadelphia, Pa.
Chicago Gear Works, 769 W. Jackson Blvd., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Cullman Wheel Co., 1346 Altgeld, Chicago, Ill.
De Laval Steam Turbine Co., N. Clinton Ave., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Farrell-Birmingham Co., 344 Vulcan, Buffalo, N. Y.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio
Grant Gear Works, Boston, Mass.
Horsburgh & Scott Co., Cleveland, O.
James Mfg. Co., D. O., 114 W. Monroe, Chicago, Ill.
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Jones Fdy. & Machine Co., W. A., 16 N. Jefferson, Chicago.
Lewellen Mfg. Co., Columbus, Ind.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Morrison Machine Co., Paterson, N. J.
Palmer-Bee Co., 1750 Poland Ave., Detroit, Mich.
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., 2100 Marshall Blvd., Chicago, Ill.
Chicago Gear Works, 769 W. Jackson Blvd., Chicago, Ill
Cleveland Worm & Gear Co., Cleveland, Ohio.
Colburn Gear & Mfg. Co. (Norfolk Downs), Quincy, Mass.
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Continental Diamond Fibre Co., Bridgeport, Conn.
Delaware Hard Fibre Co., Box 470M. Wilmington, Del.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago,
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Micart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear & Machine Co., 1390 E. 40th, Cleveland, Ohio
Stranahan Gear Co., Frederick & Valletee, Philadelphia, Pa
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa

GEARS AND PINIONS, Iron and Steel

Chicago Gear Works, 769 W. Jackson Blvd., Chicago, Ill.
Earle Gear & Machine Co., Wayne Junction, Philadelphia
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., 114 W. Monroe, Chicago, Ill.
Micart Co., St. Louis, Mo.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GEARS AND PINIONS, Rawhide

Chicago Gear Works, 769 W. Jackson Blvd., Chicago, Ill
Chicago Rawhide Mfg. Co., 1287 Elston Ave., Chicago, Ill
Gerdes & Co., 30 Church, New York, N. Y
Syracuse Rawhide Mfg. Co., Syracuse, N. Y.
Western Rawhide & Belting Co., Milwaukee, Wis

GENERATORS, Electroplating. See Plating Generators

GLASS BULBS. See Bulbs, Glass.

GLASS CANDLES. See Candles, Fixture.

GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes

Canton Glass Co., Marion, Ind.
Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y. "Equalite."
Beaumont Co., Morgantown, W. Va.
Bienenfeld Glass Wks., Inc., 1539 Covert, Brooklyn, N. Y.
Bostock Rhoades & Co., 11 N. Moore, New York, N. Y.
Chesler & Sons, J., 41 Varick Ave., Brooklyn, N. Y.
Consolidated Lamp & Glass Co., Coraopolis, Pa. "Amelite," "Aurora," "Cora-Lite," "Martele," "Nulite," "Pastelle," "Rosedora," "Shade-O-Tone."
Corning Glass Co., Corning, N. Y. "Aurene," "Calcite."
Eagle Mfg. Co., Wellsburg, W. Va.
Erskine Glass & Mfg. Co., Wellsburg, W. Va.
Forger & Co., A. H., 2414 E. 58th, Los Angeles, Cal.
Gill Glass & Fixture Co., Amber & Venango, Philadelphia, Pa. "Alliglass," "Gilligio," "Gillway," "Hyperion," "Nora," "Una," "Utilitilite," "Velva."
Iroidro," "Celatone," "N.B.G.," "Nugloss," "Nebulite," "Nemalite."
Gillinder Bros., Inc., Port Jervis, N. Y. "Apollo," "Emproidro," "Celatone."
Gillinder & Sons, Inc., Philadelphia, Pa. "Glassilk," "Persian," "Melilite," "Micro."
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
"Alabaster," "Amazon," "Blanco," "Carmia," "Carrara," "Celestialite," "Florentine," "Gletian," "Gletieco," "Opalux," "Polycase," "Silverglow."
Holophane Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O. "Nuart."
Inland Glass Wks., Inc., 6101 W. 65th, Chicago, Ill.
"Snow White," "Inlite," "Alabaster," "Cased," "Crackled," "Etched."
Ivanhoe Division of Miller Co., Meriden, Conn. "Clearcut," "Druid," "Genco," "Ivre," "Regent," "Regello," "Sudan," "Trojan," "Voloria," "Yural."
Jeannette Shade & Novelty Co., Jeannette, Pa. "Ardmore," "Tensolite."
Jefferson Glass Co., Follansbee, W. Va. "Moonstone," "Nitro-Glass."
Kopp Glass, Inc., 2210 Palmer, Swissvale, Pa. "Havana," "Nico," "Delica White."
Lamp & Glass Specialty Co., Monaca, Pa.
Macbeth-Evans Glass Co., Charleroi, Pa. "Alba," "Cremax," "Monax," "Thebian," "Lumite," "Galax."
McFaddin & Co., H. G., 38 Warren, New York, N. Y. "Bellova," "Emeralite."
Perfection Glass Co., Star City, W. Va. "Oplex."
Phoenix Glass Co., Monaca, Pa. "Ivory," "Magnolia," "Radiant."
Plaut & Co., L., 432 E. 23rd, New York, N. Y. "Berylite."
Rawson & Evans Co., 710 Washington Blvd., Chicago,

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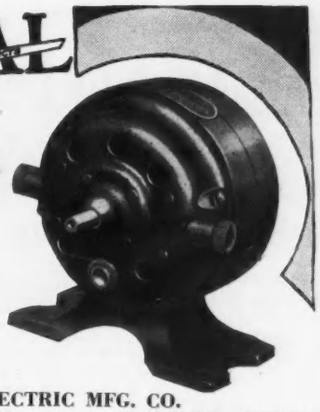

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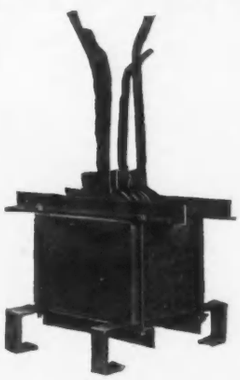

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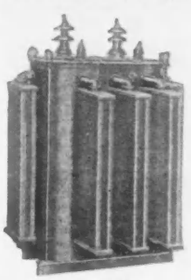

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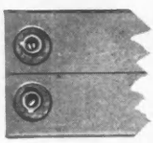

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Wells Glass Co., Kokomo, Ind. "Daylite."
Williamsburg Flint Glass Co., 290 Broadway, New York.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells

Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Liberty Bell Mfg. Co., Minerva, O.
Reiter, G. C., Canton, O.

GRAPHITE BEARINGS. See Bearings, Oil-less.
GREASE CUPS. See Cups, Grease.
GRID LEAKS. See Radio Circuit Components.
GRIDS, Resistance. See Units, Rods and Grids.
GRILL CLOTH. See Cloth, Untreated.
GRINDERS, Commutator. See Tools, Commutator Truing
GROMMETS. See Eyelets.
GROUND LOCATORS. See Instruments, Portable and Switchboard: also Testers, Coil.
GROWLERS, Armature. See Testers, Coil.
GUARDS, FAN. See Forms, Wire.

HANDLES, Wood; For Switches or Sad Irons

Allen, Chas. E., Pequabuck, Conn.
American Ename' Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
National Wood Process, New Bedford, Mass.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Strombeck-Becker Mfg. Co., Moline, Ill.
Sun Enamel Wks., Leominster, Mass.

HEATERS, Industrial

Beckwith Machine Co., 402 Chestnut, Ravenna, O.
Hold-Heet. See Russell Electric Co.
Russell Electric Co., 384 W. Huron, Chicago, Ill.
Sta-Warm. See Beckwith Machine Co.

HOLDERS, Brush. See Brushes, Commutator.
HOT WIRE METERS. See Instruments, Portable and Switchboard.
IMPREGNATING COMPOUNDS. See Wax and Compounds
IMPREGNATING, VACUUM. See Ovens, Industrial.
INCANDESCENT LAMP BULBS (Unfinished). See Bulbs Glass.
INCANDESCENT LAMP FILAMENTS. See Filaments Incandescent Lamp.

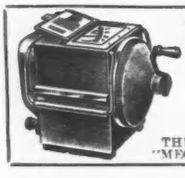
INDICATORS, Operation

Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Electric Indicator Corp., Stamford, Conn.
Elinco. See Electric Indicator Corp.

INDUCTION COILS. See Coils, Finished.
INSTRUMENT, Jewels. See Jewels.
INSTRUMENTS, Laboratory Standard. See Instruments Laboratory Standard.
INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard: also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard

Argco Laboratories, Inc., 150 W. 22nd, New York, N. Y.
Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Biddle, James G., 1209 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal (Oscilloscopes.)
Cambridge Instrument Co., Grand Central Terminal Bldg. New York, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill.
Delta-Star Elec. Co., 2437 Fulton, Chicago, Ill
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Fahy. See Rubicon Co
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Hickok Elec'l Instrument Co., 10514 Dupont, Cleveland, O.
Jagabi. See Biddle, James G.
Jewell Elec'l Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.



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Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Milvay. See Chicago Apparatus Co.
Osiso. See Westinghouse Electric & Mfg. Co.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Rubicon Co., 29 N. Sixth, Philadelphia Pa. (Wheatstone Bridges, Galvanometers, Inductance Condensers, Potentiometers, Resistance Boxes, Permeameters.)
Shallcross Mfg. Co., Collingdale, Pa.
Simplex. See Leeds & Northrup Co.
Strobatchy. See Argco Laboratories, Inc.
Stromberg Electric Co., 223 W. Erie, Chicago, Ill.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Freilinghuysen Ave. Newark, N. J.

INSTRUMENTS, Pocket

Beyer Products Co., 197 Grove, Bloomfield, N. J.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Leadrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Weston Elecl. Instrument Corp., 582 Freilinghuysen Ave. Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Portable and Switchboard

This heading includes all standard, portable and switch board types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault-finders.

See Also Instruments, Pocket; Also Instruments, Laboratory Standard.

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Bristol Co., Waterbury, Conn.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Century Elecl. Co., 100 Randall Ave., Syracuse, N. Y.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa
Edison Lamps Works of G. E. Co., (Nela Park) Cleveland,
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O. (Radio Condenser Test Set.)
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Sneedway, Indianapolis, Ind.
Etna Elec. Wks., 410 E. 15th, New York, N. Y.
Fidelity Electric Co., Lancaster, Pa.
Fisher. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Ground-Ohmer. See Sticht & Co.
Handy. See Weinberg & Co.
Heyer Products Co., 197 Grove, Bloomfield, N. J.
Hickok Elecl. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Wks., 857 Boylston, Boston, Mass.
I T L. See Illinois Testing Laboratories.
Jewell Elec'l Instrument Co., 1650 Walnut, Chicago, Ill.
King. See Electric Heat Control Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn
Multi-Volt Trouble Finder. See Welford, Jr., Geo. W
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Paragon Megohmer. See Sticht & Co., H. H.
Peerless Meters. See Thompson-Levering Co.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Pin-Jack. See Weston Elec'l Instrument Co.
Price Hollister Co., Rockford, Ill.
Queen. See Gray Instrument Co.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co. 239 Broadway, New York, N. Y
Sangamo Elec. Co., Springfield, Ill.
Shortfinder. See Eisemann Shortfinder Co.
Standco. See Sticht Co., H. H.
States Co., Hartford, Conn.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio
Stewart Bros., Ottawa, Ill.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Sticht & Co., H. H.
Two-in-One. See Stitcht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Freilinghuysen Ave. Newark, N. J.

INSULATION (Insulating) (Insulators)
Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Cutters. See Strippers, Wire.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint, Varnish, Laquer.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Rod. See Rubber, Hard.
Rubber. See Rubber, Hard.
Sealing Wax. See Wax and Compounds.
Slate. See Slate
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.

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INSULATING TUBING. See Tubing, Varnished Fabric also Tubing, Rubber.

INSULATION MIXERS

Baker Perkins Co., Saginaw, Mich.

INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy

Continental-Diamond Fibre Co., Newark, Del.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Macallen Co., 16 Macallen, Boston, Mass.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.
IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass

For Composition Jars. See Molded Insulation; also Rubber.
Corning Glass Co., Corning, N. Y.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Charleroi, Pa.
Rodefer Glass Co., 21st, Bellaire, O.
Sneath Glass Co., Wabash Ave., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa

JEWELS, Instrument Bearing

Bird, Richard H., Waltham, Mass.
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Moser Jewel Co., 367 Division, Perth Amboy, N. J.
Sapphire Products Co., 51 Chambers, New York, N. Y
Universal. See Oeffinger, J. L.
Wennstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.

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LAMINATIONS. See Discs, Armature.
LAMP BASES. See Bases, Reading Lamp.
LAMP BULBS (Unfinished). See Bulbs, Glass.
LAMP FILAMENTS. See Filaments, Incandescent Lamp
LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.
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National Lead Co., 111 Broadway, New York, N. Y.
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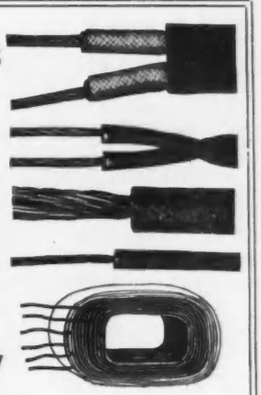

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Mica. See Molded Insulation Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
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Molded Insulation Co., 3246 Ludlow, Philadelphia, Pa.
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
National Appliance Co. (Div. of Reynolds Spring Co.) Jackson, Mich.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Norloc. See Norton Laboratories, Inc.
Northern Industrial Chemical Co., 11 Elkin (South Boston), Boston, Mass.
Norton Laboratories, Inc., Div. 85, Lockport, N. Y.
Panelyte Corp., Lincoln Bldg., New York, N. Y.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Plastic Molding Corp., Sandy Hook, Conn. (Cold.)
Pollopas. See Wilbur & Williams.
Pruven Composition Products Corp., Milford, Conn
Pruvenite. See Pruven Composition Products Co
Pyrolax. See Cutler-Hammer Mfg. Co
Recto Mfg. Co., Appleton & B.&O. R.R., Cincinnati, O.
Redmonol. See Bakelite Corp.
Rexlite. See Northern Industrial Chemical Co.
Reynolite. See National Appliance Co.
Reynomold. See National Appliance Co.
Richardson Co., Lockland, Cincinnati, O
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Bros., Inc., 312 N. Sheldon Ave., Chicago.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Star Insulate. See Insulation Mfg. Co.
Starite. See Insulation Mfg. Co.
Stokes Rubber Co., Jos., Trenton, N. J.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Synthetic Plastic Co., Inc., 535 Fifth Ave., New York, N. Y. (Molding Powder).
Textolite. See General Elec. Co., also Electrical Insulation Corp.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.
Waterbury Button Co. (Elecl. Mfg. Dept.), Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
Wilbur & Williams Co., 261 Park Square Bldg., Boston, Mass. (Molding Powder.)

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American Electro Metal Corp., 65 Madison Ave., New

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Eisler Electric Corp., 770 So. 13th St., Newark, N. J.
Fansteel Products Co., Inc., North Chicago, Ill.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Mallory & Co., P. R., 329 E. Washington, Indianapolis, Ind.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Sirian Wire Co., 255 Sherman Ave., Newark, N. J.

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International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform.
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches Snap (Heavy Duty).

MOTORS

Alternating Current	See S
Direct Current	See S
Motors, 1 Hp. up	See M
Motors Fractional Hp.	See F
Universal	See U

Actodector. See Roth Bros. Co., Div. of Century Electric Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis. M .. S ..
Allis Co., Louis, Milwaukee, Wis. M .. S ..
American Elec. Motor Co., Cedarburg, Wis. M .. .. ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1200 Hilliard, Erie, Pa. M .. .. ..
Baldor Elec. Co., 4352-D Duncan Ave., St. Louis M F S ..
B-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2256 W. Ohio, Chicago .. F S U
Bogue Elec. Co., Chas. J., 132 King, New York M .. .. ..
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O. M F .. ..
Burke Elec. Co., Erie, Pa. M F S U
B. T. See Allis Co., Louis.
B & R Mfg. Co., 813 Lafayette, Toledo, O. .. F .. ..
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Chandeysson Elec. Co., St. Louis, Mo. M .. S ..
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Continental Elec. Co., 323 Ferry, Newark M .. S ..
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Cushman Elec. Co., 69 S. Main, Concord, N. H. M F S ..
Diehl Mfg. Co., Elizabeth, N. J. M F S ..
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., Kent, O. .. .. S U
Dumore Co., 35 16th, Racine, Wis. .. F .. U
Edco. See Electro Dynamic Co.
Electric Machinery Mfg. Co., 1331 Tyler, Minneapolis, Minn. M .. S ..
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. .. ..
Electric Specialty Co., 221 South Stamford, Conn. M F S U
Electro Dynamic Co., Bayonne, N. J. M .. S ..
Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo. M F S U
Esco. See Electric Specialty Co.
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Fidelity Elec. Co., Lancaster, Pa. M F G ..
Fitzgerald Mfg. Co., Torrington, Conn. .. F .. ..
Fynn Weichsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo. F .. S ..
General Electric Co., Schenectady, N. Y. M F G ..
Gilbert Co., A. C., New Haven, Conn. .. F .. U
Hamilton Beach Mfg. Co., Racine, Wis. .. F S U
Hobart Bros. Co., Troy, O. M .. S ..
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Howell Elec. Motors Co., Howell, Mich. M F S ..
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MC. See General Electric Co.
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Osann Co., F., 245 Seventh Ave., New York M .. .. ..
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Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
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Red Band. See Howell Elec. Motors Co.
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Reynolds Electric Co., 2650 W. Congress, Chicago .. F S ..
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Sturtevant Co. (Hyde Park), Boston, Mass. M F S U
Sunlight Electrical Mfg. Co., Dana Ave., Warren, O. .. F S ..
Suner Wick. See Master Elec. Co.
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Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo. M .. S ..
Wagner Elec. Corp., 1935 Indiana Ave., St. Louis, Mo. M F S U
Walter Elec. Mfg. Co., 215 Cumberland, Norfolk, Va. M .. S ..
Watson. See Allis Co., Louis.
Welco Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S ..
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S ..
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Etching Co. of America, 1520 Montana, Chicago Ill.
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Lydon Bros., 229 Colden, Jersey City, N. J.
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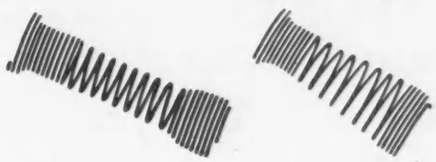

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American Di-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y. V
American Wurtzilite Co., Builders Bldg., Chicago .. P
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Arco Co., Cleveland Ohio. ..... P
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. .. L
Armitage Co., John L., 245 Thomas, Newark, N. J. V
Armiac. See Robertson Chemical Co.
Armoriac. See Armitage Co., John L.
Aroiac. See Arizona Lacquer Mfg. Co.
Art-Craft. See Southwestern Paint & Varnish Co.
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Atlas Chemical Co., 96 E. 10th, New York, N. Y. L
Ault & Wiborg Varnish Wks., 432 New, Cincinnati, O. V
Bakelite Corp., 247 Park Ave., New York, N.Y. L
Barrett Varnish Co., 1532 S. 50th Court (Cicero), Chicago, Ill. ..... V .. L
Berry Bros., Leib & Wight, Detroit, Mich. V
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Brevolite Lacquer Co., North Chicago, Ill. L
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y. ..... V P
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Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... V P
Code 25. See Mitchell-Rand Mfg. Co.
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Comulac. See Martindale Elec. Co.
Continental Diamond Fibre Co., Newark, Del..... V P L
Doe & Co., Walter S., Kent, Ohio. V
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Parlen, N. J. ..... P
Dures. See General Plastics.
Eastman Kodak Co., Rochester, N. Y. L
Eclipse Paint & Mfg. Co., Cleveland, O. ..... P
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York. L
Electric Lacquer. See Dolph Co., John C.
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Ever-Brite Products Co., 517 Broadway, East Liverpool, O. L
Ferbert-Schorndorfer Co., 12815 Elmwood Ave., Cleveland, O. ..... V P L
Fesco. See Ferbert-Schorndorfer Co.
Five Point. See American Wurtzilite Co.
General Elec. Co., Dept. M-327, Bridgeport, Conn. V P
General Plastics, Inc., 79 E. Walck Rd., N. Tonowanda, N. Y. V
George Co., P. D., St. Louis, Mo. V
G. E. See General Elec. Co.
Glidden Co., Cleveland, O. ..... V P L
Glyptal. See General Electric Co., Schenectady.
H. B. See Maas & Waldstein.
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. ..... V P L
Impervious Varnish Co., 436 Seventh Ave., Pittsburgh, Pa. ..... V P
Insulvar. See Varflex Corp.
Kodalak. See Eastman Kodak Co.
Krakles. See Brevolite Lacquer Co.
Lacerite. See Twin City Shellac Co., Inc.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. ..... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. Co., 450 E. 3rd, Dayton, O. ..... V P
Lucas & Co., John, 321 Race, Philadelphia, Pa.. V P
Lucote. See Lucas & Co., John.
Maas & Waldstein, 438 Riverside Ave., Newark, N. J. L
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O. V
Mawalac. See Maas & Waldstein.
Mecco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York.... V
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P
Nepto Lac. See Lowe Bros. Co.
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. L
O'Brien Varnish Co., South Bend, Ind. ..... V P L
Opex. See Sherwin-Williams Co.
P. & B. See Ruberoid Co.
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Sherwin-Williams Co., Cleveland, O. ..... V P L
Sico. See Standard Insulation Co.
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Southwestern Paint & Varnish Co., 610 Broadway, Kansas City, Mo ..... V P ..
Standard Flexible Comp. Co., 5242 Lancaster Ave., Philadelphia, Pa. ..... V P ..
Standard Insulation Co., East Rutherford, N. J.... V .. ..
Standard Lacquer Co., 621 Broadway, New York. L
Standard Varnish Wks., 443 4th Ave., New York. V P L
Sterling Varnish Co., Haysville, Pa. ..... V .. ..
Toch Bros., 443 4th Ave., New York. ..... V P L
Truscon Laboratories, Canfield & Grand Trunk Railway, Detroit, Mich. ..... V .. ..
1098. See Mitchell-Rand Mfg. Co.
Twin City Shellac Co., Inc., 338 Flushing Ave., Brooklyn, N. Y. ..... V P L
Varflex Corp., Rome, N. Y. ..... V .. ..
Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P ..
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Walker Co., Henry V., 17 John St., New York.. L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P ..
Zapon Co., Stamford, Conn. L
Zellac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. L

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Radio (Metal) See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Radio (Hard Rubber) See Rubber Hard.
Meters. See Instruments, Portable & Switchboard.

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Cores. See Tubes, Paper.
Fibre. See Cloth and Paper.
Fish. See Cloth & Paper.
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Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

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Gilpe Wire Co., Riverside Ave., Newark N. J.
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Omega. See Riverside Metal Co.
Phosphor-Bronze Smelting Co., 2200 Washington Ave., Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovil Mfg. Co Waterbury, Conn.
Western Cartridge Co., East Alton, Ill.

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Argeo Laboratories, Inc., 150 W. 22nd, New York, N. Y.
Burt, R. C., 327 S. Michigan Ave., Pasadena, Cal
Electric B-G Products Co., Ithaca, Mich.
Foto Cell. See National Carbon Co.
General Electric Co., Schenectady, N. Y
G-M Laboratories, Inc., Grace & Ravenswood Ave., Chicago.
Kino-Lamp. See Raytheon Mfg Co
Knowles. See Westinghouse Elec & Mfg. Co.
McWilliams. See Electric B-G Products Co.
National Carbon Co., Thompson Ave., New York, N. Y.
Photion Instrument Corp., 574 Southern Blvd., New York
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Mathews. See Foote, Pierson & Co.
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Wire Gauze. See Brushes, Commutator.
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PINIONS. See Gears and Pinions.

PINION PULLERS. See Pullers, Armature Shaft.

PLASTICS. See Molded Insulation.

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Buss Structure Co., Besse Bldg., Springfield, Mass. (Steel.)
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Eden Mfg. Co., Plymouth, Mass.
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Fort Wayne Battery Mfg. Co., 230 E. Fourth, Ft. Wayne.
Handler. See Witherbee Storage Battery Co.
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New Jersey Storage Battery Co., 656 Summit Ave., Union City, N. J.
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Columbia Elec. Mfg. Co., 1292 E. 53rd, Cleveland, Ohio.
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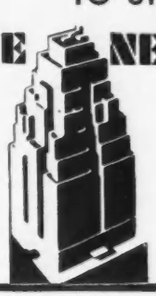

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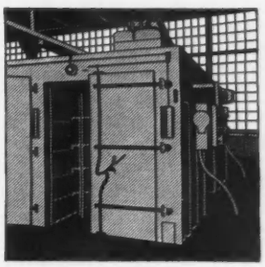

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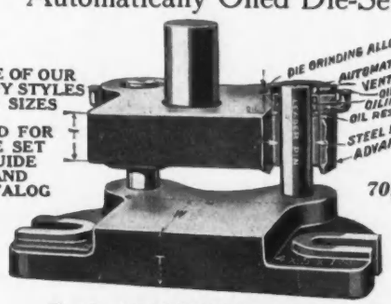

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Cenco. See Central Scientific Co.
Central Scientific Co., 460 E. Ohio, Chicago, Ill.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Elec. Corp., 770 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Megavac. See Central Scientific Co.
Packard. See Hubbard's Sons, Norman.
PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel

Anderson Mfg. Co., Albert & J. M., 289 A Boston, Mass.

RACKS, Wire Reel

(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1826 Cheuteau Ave., St. Louis Mo. (Tensionless Dereeler.)
Columbia Machine Works & Malleable Iron Co., 263 Chestnut, Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS

This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
Acme Appar. Corp., 39 Osborne, Cambridge, Mass.
Acme Wire Co., New Haven, Conn.
Aero-Cal. See Aero Products, Inc.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Ajax Elec. Specialty Co., St. Louis, Mo.
Akra-Ohm. See Shallcross Mfg. Co.
Alden Mfg. Co., Brockton, Mass.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Apparatus Co., Richmond, Ind.
American Transformer Co., 178 Emmet, Newark, N. J.
Amperite Rheostat. See Radiall Co.
Amrad Corp., Medford, Hillside, Mass. (Electrolytic Condensers.)
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic. See Premier Elec. Co.
Art Dial. See Pilot Radio & Tube Corp.
Audioformer Transformer. See Pacent Electric Co.
Autoformer. See Thordarson Elec. Mfg. Co.
Automatic Oil Heat Co., 9294 E. Fourth, St. Paul, Minn.
Automotive Parts Mfg. Co., 70 Washington St., Brooklyn.
B-Conomizer. See Pilot Radio & Tube Corp.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 299 Ellicott, Buffalo, N. Y.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., Calvary, Waltham, Mass.
Buffalo. See De Jur-Amsco Corp.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Radio & Tube Corp.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill.
Centraline. See Pilot Radio & Tube Corp.
Certified Condenser. See Radio Condenser Co.
Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Clarostat Mfg. Co., 281 N. Sixth, Brooklyn, N. Y. (Radio Resistance.)
Cleveland Steel Products Corp., 7306 Madison Ave., Cleveland, O.
Concertone. See Chicago-Jefferson Fuse.
Connectorads. See Alden Mfg. Co.
Continental Carbon, Inc., 13904 Lorain, Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Cornell Elec. & Mfg. Co., Ansable & Rawson, Long Island City, N. Y.
Cresradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Croft. See Premier Elec. Co.
Daven Co., 158 Summit, Newark, N. J. (Kits)
Davohm. See Daven Co.
DeForest Radio Co., Passaic, N. J.
De Jur-Amsco Corp., Broome and Lafayette Sts., New York, N. Y.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 342 Madison av., New York
Dumont Elec. Co., 40 W. 17th, New York, N. Y.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dynohmic. See Lynch, Inc.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
El Menco. See Electro Motive Engineering Co.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast & Co., John E., 3123 N. Crawford, Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See De Jur-Amsco Corp.
Filterettes. See Tobe Deutschmann Co.
Fleschheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 830 4th Ave., Brooklyn, N. Y.
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind.
Furnell Die Cast Condenser Corp., 16 Hudson, New York
F & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 225 Varick, New York, N. Y.
General Mfg. Co., 8066 S. Chicago Ave., Chicago, Ill. (Coils.)
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 910 W. Jackson Blvd., Chicago.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Glastor. See Daven Co.
Globar Corp., Niagara Falls, N. Y.
Gray & Danielson Mfg. Co., 2101 Bryant, San Francisco, Cal.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hardwick, Hindle, Inc., 216 Emmett, Newark, N. J.
Harmonik. See Karas Elec. Co.
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Penn. Ave. & Plum, Trenton, N. J.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 4322 Lake Ave., Rochester, N. Y.
Infra-Lyne. See Gray & Danielson Co.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa.
Isograd, Isoleak. See Pilot Radio & Tube Corp.
Jefferson Electric Co., 1500 S. Laflin, Chicago, Ill.
Kenyon Transformer Co., 122 Cypress Ave., New York, N. Y.
Kilograd. See Pilot Radio & Tube Corp.
Krobiack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance).
Leakandenser. See Daven Co.
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnia. See General Winding Co.
Loftin-White. See Hammarlund Mfg. Co.
Lynch Mfg. Co., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Maxitran. See Electrical Research Laboratories.
Mayo Laboratories, Inc., 281 E. 137th, New York, N. Y.
Marion Elec. Mfg. Co., 34 Cliff, Jersey City, N. J.
Meicoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Mershon. See Amrad Corp.
Metaleak. See Dubilier Condenser Corp.
Metraligh. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y. (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Microgrid. See Pilot Radio & Tube Corp.
Microstat. See Premier Elec. Co.
Midline. See Hammarland Mfg. Co.
Mignon Electric Corp., 909 Genesee, Buffalo, N. Y.
Mountford, C. E., 30 Sullivan, New York, N. Y.
National Co., 61 Sherman St., Malden, Mass.
Neutro-Grad. See Pilot Radio & Tube Corp.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohio Carbon Co., 1528 Almira Ave., Cleveland, O.
Ohmite Mfg. Co., 633 N. Albany Ave., Chicago, Ill. (Resistance.)
Orthophone. See De Jur-Amsco Corp.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Sam Amplifier. See Samson Electric Co.
Perry Elec'l Resistor Corp., 280 New Main St., Yonkers, N. Y.
Phantrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Pierce Airo. See United Scientific Laboratories.
Pierce Mfg. Co., 625 W. Jackson Blvd., Chicago, Ill.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Radio & Tube Corp.
Potter Mfg. Co., North Chicago, Ill. (Electro-Chemical Condensers.)
Polymet Mfg. Corp., 829 E. 134th St., New York, N. Y.
Power Box. See Scott Sales Co.
Powerohm. See International Resistance Co.
Powrad, Inc., 121 Ingraham, Brooklyn, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.
Protectorsid. See Alden Mfg. Co.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Appliance Corp., 30 Taylor, Springfield, Mass.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Receptor Co., 106 7th Ave., New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Receptrad. See Radio Receptor Co.
Reesonator. See F. & H. Radio Laboratories.
Remler. See Gray & Danielson Co.
Resistogrid. See Pilot Radio & Tube Corp.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hathaway Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Roberston-Davis Co., 363 W. Superior, Chicago, Ill.
Royalty. See Electrad, Inc.
Samson Elec. Co., Canton, Mass.
Sangamo Electric Co., Springfield, Ill. (Transformers & Condensers.)
Scovill Mfg. Co., Waterbury, Conn.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 379 Phillips Ave., Toledo, O.
Shallcross Mfg. Co., 700 Parker Ave., Collingdale, Pa.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 6401 W. 65th St., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. T. See General Instrument Corp.
Splitmeter See Premier Electric Co.
Sprague Specialties Co., North Adams, Mass.
Standard Transformer Co., Dana Ave., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stevens Mfg. Corp., 42 Spring, Newark, N. J.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Super Multiformer. See Precise Mfg. Corp.
Super Tonatrol. See Electrad, Inc.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Synrodenser. See Precise Mfg. Corp.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Tobe Deutschman Co., Canton, Mass.
Tone Control. See Sprague Specialties Co.
Transcontinent-Clapp Kit. See Samson Electric Co.
Trunhonic Amplification. See Alden Mfg. Co.
Tunadarta. See Lynch, Arthur H.
Tung-Sol Condensers, Inc., 2317 Calumet Ave., Chicago, Ill. (Electrolytic Condensers.)
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Rodine Electric Co.
Ultra-Vario. See Bruno Radio Corp.
Universiter Condenser. See Auburn Button Works.
Universal Electro Chemical Corp., 30 W. 15th, New York
Universal Winding Co., Boston, Mass.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Voita. See Universal Electro Chemical Corp.
Volumgrad. See Pilot Radio & Tube Corp.
Ward Leonard Electric Co., 31 South, Mount Vernon, N. Y.
Wasp. See Pilot Radio & Tube Corp.
Wheeler Insulated Wire Co., Bridgeport, Conn.
Wireless Specialty Apparatus Co., 76 Atherton, Jamaica Plain, Boston, Mass.

RADIO HARDWARE. See Radio Mountings.

RADIO MOUNTINGS

Coil Mountings, Coil Sliders and Rods, Switches, Detectors Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels etc.
Aerovox Wireless Corp., 70 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Brockton, Mass.
American Emblem Co., Utica, N. Y. (Escutcheons.)
American Radio Hardware Co., 135 Grand, New York.
Bonart. See Haydon & Haydon.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
De Jur-Amsco Corp., Broome and Lafayette Sts., New York N. Y.
Chapman Machine Co., Terryville, Conn.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 99 Tenth, Long Island City, N. Y. (Metal Panels.)
Eureka. See Morse Co. Frank W.
General Etching & Mfg. Co., 3072 West Grand Ave., Chicago, Ill. (Metal Panels & Escutcheons.)
Globe Technolian Corp., Reading, Mass.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
Master Engineering Co., 771 Mather, Chicago, Ill.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Na-Ald. See Alden Mfg. Co.
Union Insulating Co., 296 Broadway, New York, N. Y.
Waddell Mfg. Co., Grand Rapids, Mich.
Yaxley Mfg. Co., 1528 W. Adams, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.
Alden Mfg. Co., Brockton, Mass.
Acme Elec. & Mfg. Co., 1439 Hamilton Ave., Cleveland, O.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Amacostat. See American Apparatus Co.
American Apparatus Co., Richmond, Ind.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. (Multiple Plugs.)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Cabelug. See Jones, Howard B.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill. (Also Socket Adapters.)
Cinch Mfg. Corp., 2335 W. Van Buren, Chicago, Ill.
Clarostat Mfg. Co., 281 N. Sixth, Brooklyn, N. Y.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
De Jur-Amsco Corp., Broome and Lafayette Sts., New York, N. Y.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Duostat. See De Jur-Amsco Corp.
Dynofilter Mfg. Co., 1022 E. 178th, New York, N. Y. (Interference Eliminator).
Eby Mfg. Co., H. H., 22nd & Lehigh Ave., Philadelphia.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Insulation Corp., 308 W. Washington, Chicago.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Frost, Herbert H., 1142 W. Beardsley, Elkhart, Ind.
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 2101 Bryant, San Francisco.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heinemann Elec. Co., Penn Ave. & Plum, Trenton, N. J.
Imp. See Carter Radio Co.
Jones, Howard B., 2300 Wabansia, Chicago. (Multiple Plug)
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Micrograd. See Pilot Radio & Tube Corp.
Morse Co., Frank W., 291 Congress, Boston, Mass
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.
Recto Mfg. Co., Appleton & B.&O. R.R., Cincinnati, O.
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
Royalty. See Electrad, Inc.
Samson Elec. Co. Canton, Mass.
Shallcross Mfg. Co., Collingdale, Pa.
Socostat. See D. A. Radio Co.
Workrite Radio Corp., 1838 E. 30th, Cleveland, O.
Yaxley Mfg. Co., 1528 W. Adams, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Electric Co., 187 Sylvan Ave., Newark, N. J.
Arcturus Radio Tube Co., 260 Sherman Ave., Newark, N. J.
Audion. See De Forest Radio Co.
Cable Radio Tube Corp., 80 N. Ninth, Brooklyn, N. Y.
Ceco Mfg. Co., 1200 Eddy, Providence, R. I.
Robertson-Davis Co., 363 W. Superior, Chicago, Ill.
Cunningham, Inc., E. T., 270 Seventh Ave., New York, N. Y.
Daven Co., 158 Summit, Newark, N. J.
DeForest Radio Co., Passaic, N. J.
Diamond Electric Co., Newark, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago.
Diatron. See Diamond Vacuum Products Co.
Eveready Raytheon. See National Carbon Co.
Gold Seal Electrical Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hygrade Lamp Co., Salem, Mass.
Hytron Corp., Salem, Mass.
Jaeger Research Laboratories, 280 Park Ave., Weehawken, N. J.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
National Carbon Co., Thompson Ave., Long Island City, N. Y.
National Union Radio Corp., 400 Madison Ave., New York.
Neptron See Hygrade Lamp Co.
Paramount Mfg. Co., 79 Orange, Newark, N. J.
Pentode. See Ceco Mfg. Co.
Perrygman Electric Co., 4901 Hudson Blvd., North Bergen, N. J.
Radio-Victor Corp. of America, 233 Broadway, New York.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio
Sylvania Products Co., Emporium, Pa.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington, N. J.
Van Horne Tube Co., 280 Center, Franklin, Ohio.

RADIO TRANSFORMERS. See Radio Circuit Components.

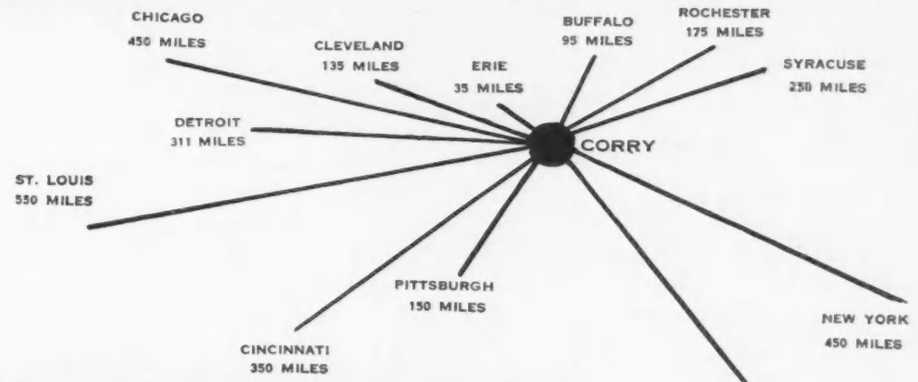
RADIO TUBE BASE BRANDERS. See Engraving Radio Panel.

RADIO TUBE BASES. See Radio Molded Parts.

RADIO TUBE BULBS (Unfinished). See Bulbs, Glass

RADIO TUBE PARTS

Filament Hooks, Mesh Plates, Special Bolts & Nuts, Stampings, etc.
Goat Radio Tube Parts, Inc., 33 35th, Brooklyn, N. Y. (Screens.)
Juno Fasteners, Inc., Hillside, N. J.
Newark Plate Laboratories, 223 Jelliff Ave., Newark, N. J. (Mesh Plates.)



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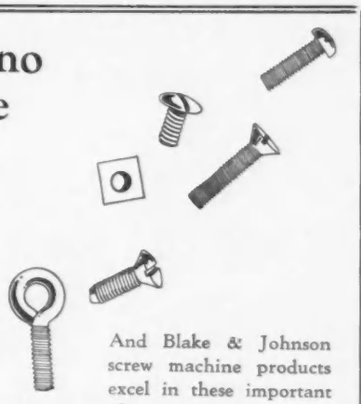

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RADIO TUBE PARTS—Continued.
Newark Wire Cloth Co., 351 Verona Ave., Newark, N. J. (Screens).

RADIUM POWDER AND PAINT

Radium Dial Co., 3552 Forbes, Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y.
RANGE SWITCHES, Rotary Snap. See Switches, Snap Heavy Duty.
RAWHIDE GEARS. See Gears & Pinions, Rawhide.
READING LAMP BASES. See Bases, Reading Lamp.
REAMERS, Pipe. See Stocks, Dies and Reamers.
RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

	KEY
Battery Charging	See B
Floor Boxes	See F
Welding	See W
Machine Tool	See W
Watertight, Marine, Mine	See M
Car Trailer Connection	See C
Extension	See E

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F
Adapti Co., 2996 E. 72nd, Cleveland, O. F
Anderson Mfg. Co., Albert & J. M., 289 A Boston, Mass. B W M E
Appleton Elec. Co., 1793 Wellington Ave., Chicago, Ill. M
Arktite. See Crouse-Hinds Co.
Arnessen Electric Co., 18 Water, New York M
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. F B W
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. B
Benjamin Elec. Mfg. Co., Des Plaines, Ill. F W M
Bryant Elec. Co., 1421 State, Bridgeport, Conn. (Also Range Type.) W
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal. F
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. M
Cinderletto. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. F
Cory & Son, Chas., 183 Varick, New York M
Crouse-Hinds Co., Syracuse, N. Y. B W
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. F
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa. C
Fielding. See Stanley & Patterson.
Fountain's. See Jenkins Mfg. Co.
Fullman Mfg. Co., Latrobe, Pa. F M
Fullman. See Steel City Elec. Co.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. B
Gleason & Co., J. L., 241 Franklin, Boston, Mass. B
Groundsafe. See Novelty Electric Co.
H. & H. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. B W
Hessel Co., W. F., 76 Greenwich, New York, N. Y. W M B
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.) B W
Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. B
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W
Latrobe. See Fullman Mfg. Co.
Lexington Electric Products Co., 12 Chapel, Newark, N. J. C
Loeffelholz & Co., Milwaukee, Wis. C
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill. M
Neco. See Novelty Elec. Co.
NePage McKenny Co., 804 Sixth Ave., S. Seattle, Wash. F
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa. C
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Perkins. See Bryant Elec. Co.
Porto. See Hessel Co., W. F.
Preset. See Walker Bros. Co.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill. W M C B
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.)
Raleo Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Russell & Stoll Co., 53 Rose, New York F B W M B
Square D Co., Detroit, Mich. W
Stanley & Patterson, 150 Varick, New York, N. Y. F
Steel City Elec. Co., 1207 Columbus Ave., Pittsburgh, Pa. F E
Thomas & Betts Co., 15 Park Place, New York, N. Y. F
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa. M
Walker Bros., 12 E. 41st St., New York, N. Y. F B
Weldomatic. See Westinghouse Elec. & Mfg. Co.

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F B W M
Yale. See Electric Products Co.
RECORDERS, Elapsed Time. See Indicators, Operation
REDUCERS, Socket. See Socket Reducers.
REFLECTOR LENSES. See Lenses.

REFLECTORS, Chromium Plated, Metal

Aga Auto Lamp Co., Amesbury, Mass.

REFLECTORS, Porcelain Enameled, Steel

ABolite Reflector Co., West Lafayette, Ohio.
Benjamin Elec. Mfg. Co., Des Plaines, Ill
Dunlap Co., John, Hammond & Gregg, Carnegie, Pa.
Duratach. See Wheeler Reflector Co.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 2935 N. Oakley Ave., Chicago, Ill.
Holux. See Wheeler Reflector Co.
Jumbo. See Quadrangle Mfg. Co.
Marbelite Art Products Co., 1[illegible] N. Robey, Chicago, Ill
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill
Oamaco. See Overbaugh & Ayers.
Overbaugh & Ayers Mfg. Co., 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill.
Reliability. See ABolite Reflectors Co.
Richardson Reflector Co., 18 Hudson, New York, N. Y
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.
REFRACTORIES, Porcelain. See Cores Resistance Coil.
REFRIGERANTS. See Chemicals, Refrigeration.
REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS

Alaska Refrigerator Co., Muskegon, Mich.
Arlington Refrigerator Co., Arlington, Vt.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectriCE Corp., Belding, Mich.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bohn Refrigerator Co., 1340 University Ave., St. Paul, Minn.
Cavalier. See Tennessee Furniture Co.
Champion Refrigerator Co., 206 Lexington Ave., New York
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dry-Air. See Baldwin Refrigerator Co.
Eddy & Sons Co., D., 236 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Harder Refrigerator Corp., Cobleskill, N. Y.
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y
Herrick Refrigerator Co., 1803 River, Waterloo, Iowa.
Hibbard Cabinets, Inc., 6504 Euclid Ave., Cleveland, O
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Howe Scale Co., Rutland, Vt.
Hudson. See Harder Refrigerator Corp.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Klein & Kold. See Harder Refrigerator Corp.
Knox. See Erie Art Metal Co.
Leonard Refrigerator Co., Div. of Kelvinator Corp., Grand Rapids, Mich.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y.
(The Cream Cabinet.)
Lorillard Refrigerator Co., 40 Cooper Square, New York.
Louisville Refrigerator Corp., 4488 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2664 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.
Niagara. See Heinz & Munschauer.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Reel. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Sanitor. See Bohn Refrigerator Co.
Schmidt Co., C., John and Livingston, Cincinnati, O
Seeger Refrigerator Co., Arcade and Wells Sts., St. Paul, Minn.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Syphon. See Bohn Refrigerator Co.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.
REFRIGERATOR CONDENSER UNITS. See Condenser Units, Refrigerator.

REFRIGERATOR FITTINGS

Commonwealth Brass Corp., Commonwealth Ave. & G. T. R. R., Detroit, Mich.

REGULATORS, Temperature

American Radiator Co., 1807 Elmwood Ave., Buffalo, N. Y
(Mercury Switch Type.)
American Telethermometer Co., 1017 Summit, Toledo, O.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J
Automatic Electric Heater Co., 1524 Race, Philadelphia, Pa. (Furnace.)
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Bake-O-Meter. See Cooper Oven Thermometer Co.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Bristol Co., Platters Bridge & Naugatuck Rd., Waterbury, Conn.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Ceaco. See Cobb Electric Appliance Co.
Cobb Electric Appliance Co., 100 Massachusetts Ave., Boston
Cooper Oven Thermometer Co., Pequabuck, Conn.
Davis & Daggett Co., 238 Dwight, Springfield, Mass.
Duo-Stat. See Raymond Co.
D. & T. Manufacturing Co., 3001 La Salle, St. Louis, Mo.
Dunco. See Struthers Dunn, Inc.
Electric Automatic Appliance Co., 1748 Arapahoe, Denver, Colo.
Engelhart, Chas., 90 Chestnut, Newark, N. J.
Gifford Heat Control Systems, 1 Broadway, New York.
Gold Car Htg. & Ltg. Co., 220 36th, Brooklyn, N. Y.
Hart Mfg. Co., Hartford, Conn.
Hermansen Elecl. Co., 505 W. 41st, New York, N. Y.

ELECTRIC CONTROL APPARATUS

Vitrohm Resistors
vitreous enamelled for protection and long life.

Ribohm Resistors
for greatest watts in smallest space.

WARD LEONARD ELECTRIC CO.
31-41 *South St., Mount Vernon, N. Y.*

Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Jewell Mfg. Co., Auburn, N. Y.
Johnson Service Co., 149 Michigan, Milwaukee, Wis.
Lockswitch. See Time-O-Stat Controls Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Marvel. See American Thermostat Co.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill. (Mercury Switch.)
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., Minneapolis, Minn.
Penn Electric Switch Co., E. 20th & Walnut Sts., Des Moines, Iowa.
Protectostat. See Minneapolis-Honeywell.
Quick Freeze. See Penn Electric Switch Co.
Ranco. See Automatic Reclosing Circuit Breaker Co.
Raymond Co., F. I., 228 N. La Salle, Chicago, Ill.
Savoltite Devices, Inc., 88 Manhattan, Rochester, N. Y.
Simplex Heat Regulator, 2938 Pillsbury Ave., Minneapolis
Snapon. See Tagliabue Mfg. Co.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Sure Fire. See Boston Machine Wks.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Time-O-Stat Controls Co., Elkhart, Ind.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Webster Elec. Co., Racine, Wis.
White Mfg. Co., 2362 University Ave., St. Paul, Minn.
Wilcolator Co., Newark, N. J.
Wilson-Maeulin Co., 383 Concord Ave., New York, N. Y.

REGULATORS, Voltage

American Instrument Co., 774 Girard, N. W., Washington, D. C.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Marshall Electric Co., Elkhart, Ind.
Motor. See Ward-Leonard Electric Co.
States Co., 19 New Park Ave., Hartford, Conn.
Ward-Leonard Electric Co., 31 South, Mount Vernon, N. Y. (See also Circuit Breakers and Thermostats.)

RELAYS

American Brown Boveri Elec. Corp., Camden, N. J.
Automatic Switch Co., 154 Grand, New York, N. Y.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Burkaw, Inc., 30 Court, Newark, N. J.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Electric B-G Products Co., Ithaca, Mich.
Dunco. See Struthers Dunn, Inc.
General Electric Co., Schenectady, N. Y.
G-M Laboratories, Inc., Grace & Ravenswood Ave., Chicago.
Grid Glow. See Westinghouse Elec. & Mfg. Co.
Leach Relay Co., 860 S. Los Angeles, Los Angeles, Cal.
McWilliams. See Electric B-G Products Co.
Roller Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 154 W. 14th, New York.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., Newark, N. J.
REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.
RESINOID PLASTICS. See Molded Insulation.

RESISTANCE
Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments
Units, Radio. See Radio Circuit Components
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS

Hardwick, Hindle, Inc., 216 Emmett, Newark, N. J.
Ohmite Mfg. Co., 633 N. Albany Ave., Chicago, Ill.
Ward Leonard Electric Co., 31 South, Mount Vernon, N. Y.
RESISTORS. See Units, Rods & Grids.
RESURFACERS, Commutator. See Stones, Commutator, also Tools, Commutator Truing.
REVOLUTION COUNTERS. See Tachometers.

RHEOSTATS.
Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

F B D P M L

Allen-Bradley Co., 493 Clinton, Milwaukee L
Beck Bros., 421 Sedgley Ave., Philadelphia, Pa. L
Biddle, James G., 1209 Arch, Philadelphia L
Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.) B
Bradleystat. See Allen-Bradley Co.
Columbia Electric Mfg. Co., 1292 E. 53rd, Cleveland, O. P
Controlite. See Ward Leonard Elec. Co.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. F B D L
Economic Rheostat Switch Co., 3851 N. 5th, Philadelphia, Pa. F
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O. F
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. B
General Electric Co., Schenectady, N. Y. F L
Hanson-Van Winkle-Munning Co., Matawan, N. J. P
Holzmuller, C. J., 1108 Howard, San Francisco, Cal. D

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Phosphor Bronze

50 Years of Service
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For this period of time Elephant Brand Phosphor Bronze has been used with unfailing success by all industry.

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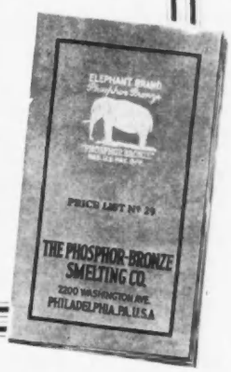
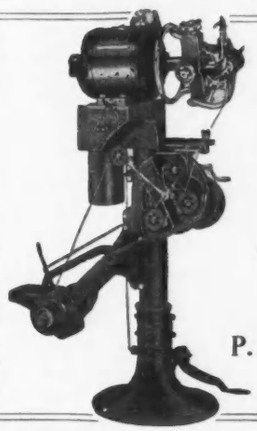


THE PHOSPHOR BRONZE SMELTING CO.
2200 Washington Ave. Philadelphia, Pa.



Quickly Adjustable, Yet a Real
PRODUCER
The Chapman Style 3 Armature Winding Machine
On it 50 to 650
Armatures are Being Wound per Day
P. E. Chapman Elec'l Works
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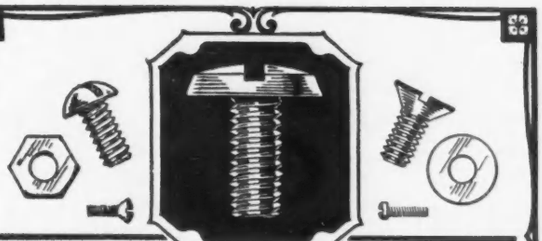


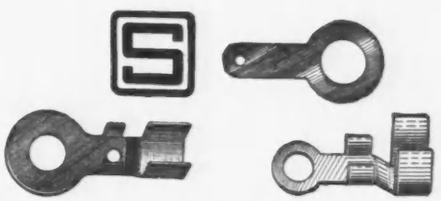
All kinds of Electrical Screws carried in stock
WRITE FOR PRICES
NEW ENGLAND SCREW CO.
DEPT. A
44 FARNSWORTH ST. BOSTON, MASS.

There is no terminal application that can't be thoroughly covered with
SHERMAN
TERMINALS

THAT we are the largest makers of brass and copper wire and cable terminals in the world is a fact well known throughout the electrical industry.

This fact should also convince you that SHERMAN is in a position to supply every terminal need, providing not only the highest electrical efficiency but at the lowest possible cost, as well.

Come to Terminal Headquarters for the *final* solution of any terminal problem —the stocks are complete and *standardized.*



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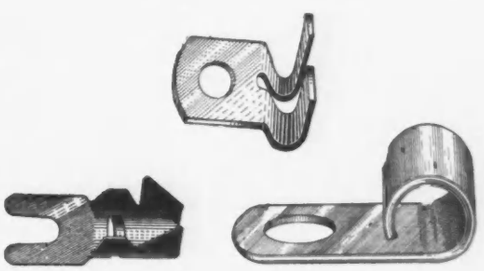
Headquarters for *ALL* Terminals
Battle Creek, Mich.



MODERNIZATION

Attention of the reader is called especially this month to the article on the electrical modernization of industries plan described on Page 50. Every electrical manufacturer will be interested in this plan because of its great sales making possibilities.

RHEOSTATS—Continued
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. . . . . D . . M . .
Knoeller Elec. Co., De Pere, Wis. . . . . F . . . . . .
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago. . . . . F B D . . M L
Optimus. See Hanson-Van Winkle-Munning Co.
New York, N. Y. . . . . M . .
Schaefer Bros. Co., 1059 W. 11th, Chicago . . B . . . . . .
Simplicity. See Cutler-Hammer Mfg. Co.
Robertson, Lee F., Inc., 532 W. 22nd, Rubicon Co., 29 N. Sixth, Philadelphia. L
Universal. See Ward Leonard Elec. Co.
Vitrohm. See Ward Leonard Elec. Co.
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y. . . . . F . . D . . M . .
Wotton. See Electric Products Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. . . . . F . . . . . M .
RINGS Seal. See Packing.

RIVETS
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
American Brass Co., Waterbury, Conn.
Blake & Johnson Co., 1497 Thomaston Ave. (Waterville), Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Rivet & Specialty Co., 1830 S. 54th, Chicago, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.
RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening
Columbia Machine Works & Malleable Iron Co., 263 Chestnut, Brooklyn, N. Y.
RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard
Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., Ashtabula, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Luzerne Rubber Co., Muirhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Corp., Lincoln Bldg., New York, N. Y.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Jos., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave., New York, N. Y.
Vulco Panels. See Vulcanized Rubber Co.

RUBBER, MECHANICAL GOODS
Goodrich Rubber Co., B. F., Akron, O.
Manhattan Rubber Mfg. Co., Willet, Passaic, N. J.
Republic Rubber Co., Youngstown, O.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Dept. W., Ashland, O.
RUBBER, SEMI-HARD. See Rubber Mechanical Goods.

RUBBER, Sponge
Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Dept. W., Ashland, O.
RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines
SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW DRIVING MACHINES
Vim Electric Tool Co., 149 Broadway, New York, N. Y

SCREW MACHINE PRODUCTS
American Metal Wks., 4865 Stenton Ave., Philadelphia, Pa.
Arrow Automatic Products Corp., 27 Vestry, New York,
Barnes Co., Wallace, Bristol, Conn.
Belco. See Bell Co., David.
Bell Co., David, 1555 Fillmore Ave., Buffalo, N. Y. (Special Parts.)
Blake & Johnson Co., 1497 Thomaston Ave., Waterville,
Blake & Johnson Co., 1497 Thomaston Ave. (Waterville), Waterbury, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Brighton Screw & Mfg. Co., 1456 Harrison Ave., Cincinnati, O.
Cameron Elecl. Mfg. Co., Ansonia, Conn.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.

SCREW MACHINE PRODUCTS AND SPRINGS
for every purpose
WILLIAM STEINEN & COMPANY
297 Washington St. Newark, N. J.

Colonial-Premier Co., 229 W. Ohio, Chicago, Ill.
Continental-Diamond Fibre Co., Newark, Del.
Corbin Screw Corp., 226 High, New Britain, Conn.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Great Western Mfg. Co., La Porte, Ind.
Hanson, Elnar B., 17 Hermon, Worcester, Mass.
Hartford Machine Screw Co., 476 Capitol Ave., Hartford, Conn.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Humason Mfg. Co., Forestville, Conn.
Interstate Products Corp., 503 Mulberry, Newark, N. J.
Linden & Co., 891 Broad, Providence, R. I.
Mattatuck Mfg. Co., Waterbury, Conn.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass
Olson Mfg. Co., 56 Commercial, Worcester, Mass.
Parent Machine & Screw Co., 50 Canal, Salem, Mass.
Peck Spring Co., Plainville, Conn.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Screw Machine Products Corp., Providence, R. I.
Shimer & Sons, Samuel J., Milton, Pa.
Steinen & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Corp., Thomaston, Conn.
Watkins Co., D. M., 270 Pine, Providence, R. I.
Waterbury Brass Goods Corp., Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.
Wright Machine Co., 79 Armory, Worcester, Mass.

SCREWS, Cap (Cut Thread)
Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive
Hassell, Inc., John, 402 Oakland, Brooklyn, N. Y.
Parker-Kalon Corp., Dept. K., 198 Varick, New York, N. Y.

SCREWS, Machine
Blake & Johnson Co., 1497 Thomaston Ave. (Waterville), Waterbury, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 499 Hancock Ave., Bridgeport, Conn.
Elco Tool & Screw Corp., 1818 Broadway, Rockford, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Screw Machine Products Corp., Providence, R. I.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.
United Screw & Bolt Corp., 2713 Cullerton, Chicago, Ill.

SCREWS, Machine (Cut Thread)
American Screw Co., Providence, R. I.
SECOHMMETERS. See Instruments, Laboratory Standard
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery
Campbell Elec. Co., Kansas City, Mo.
Carlile & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Indianapolis Box & Separator Co., 2101 Yandes, Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Heinrick, Inc., 555 W. 52nd, New York, N. Y
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., B., 539 W. 52nd, New York. (Wood.)

SHADES
Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretenne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Molded. See Molded Insulation.
Mosaic. See Shades and Domes.
Parchment. See Shades, Fabric.
Paper. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric
Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo. Parchment.
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatford Ave., Brooklyn.
Bloch & Co., L. D., 37 E. 18th, Newark, N. Y.
Borghese. See Hall, Chas.
Clark, H. W., 813 Fourth Ave. N., Troy, N. Y. (Parchment.)
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss, Leonard R., 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss, Leonard R.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chints.)
Harris Mfg. Co., 121 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Idealite Lamp Shade Mfg. Co., 4955 Fremont, Jersey City, N. J. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)

Screw Machine Products
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WORCESTER, MASS.

Patent Lamp Shade Co., 1361 Frankford Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., 2425 Spy Run, Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 33 W. 34th, New York, N. Y. (Silk.)
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Wardwell, E. H., 11 E. 36th, New York, N. Y.

SHADES AND DOMES
Leaded, Mosaic or Figured, Stamped or Cast Metal.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.
SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic
Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 17 W. 60th, New York, N. Y.)
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin Copper.)
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oameo. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)

SHADES, Mica
Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.
SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.
SHEARS, Metal Cutting. See Shears, Power.
SHEARS, Rotary. See Shears, Power.

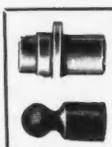
SHEARS, Insulation
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEARS, Power
Niagara Machine & Tool Wks., 637 Northland, Buffalo, N. Y.
SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket
Chase Brass & Copper Co., Waterbury, Conn.
Dallas Brass & Copper Co., Div. of Revere Copper & Brass, Inc., 820 Orleans, Chicago, Ill.
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
Patton-MacGuyer Co., Providence, R. I.
Riadon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA
Ottawa Silica Co., Ottawa, Ill. "Flint Shot."
SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire
Baker & Co., Inc., 54 Austin, Newark, N. J.
Eisler Electric Corp., 770 S. 13th St., Newark, N. J.
General Plate Co., Attleboro, Mass.
Gilby Wire Co., Riverside Ave., Newark, N. J.
Handy & Harman, 57 William, New York, N. Y.
National-Harris Wire Co., Newark, N. J.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J.
SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SIGN ELECTRODES, Gas. See Electrodes for Gas Signs.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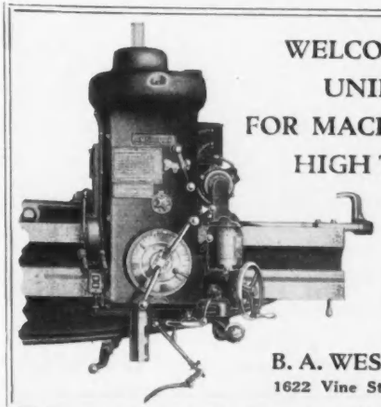

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SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE

For Switchboard Slabs and Barriers.
Davis Slate & Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Monson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.
SLEEVE-BEARINGS. See Bearings and Bushings.
SLEEVING, Cotton. See Tape, Cotton.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator

(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hullhorst Micro Tool Co., 3242G Monroe, Toledo, O.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weidenhoff, Joseph.
South Bend Lathe Works, 425 E. Madison, South Bend, Ind.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
White Dental Mfg. Co. (Industrial Div.), S. S., 152 W. 42nd, New York, N. Y.
SNAP SWITCHES. See Switches, Snap.

SOAPSTONE

For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Kirchberger & Co., Inc., 1425 37th, Brooklyn, N. J.
Lin-Stun. See Westinghouse.
Westinghouse Elec & Mfg. Co., East Pittsburgh, Pa.
SOCKET LININGS. See Linings, Socket.
SOCKET SHELLS. See Shells, Screw Socket.
SOCKETS, Flashing. See Flashers, Sign.

SOCKET Chain Attachments

Chain Links, Chain Adjusters, Acorns, Extensions, Insulated Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. S., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Div. H, Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn. (Acorns.)
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insu-

SOCKET REDUCERS

Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cen-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hart & Hegaman Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Inc., Div. H, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 80 Boylston, Boston, Mass.
SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key ..... See K
Composition ..... See W
Metal Shell ..... See B
Porcelain ..... See A
Pull Chain ..... See P
Push Through ..... See T
Sign Receptacles ..... See A

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... A
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo. ..... W
Alabax. See Arrow Elec. Co.
Alcor Mfg. Co., 4605 W. Madison, Chicago, Ill. C
Appleton Electric Co., 1703 Wellington
Appleton Electric Co., 1750 Wellington Ave., Chicago, Ill. ..... A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. ..... A
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. M C K T P B A
Arrogrip. See Arrow Elec. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. ..... C P B
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport. ..... M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. ..... M K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. .....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M K T B A
Crouse-Hinds Co., Syracuse, N. Y. ..... A W
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. ..... K T B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, New York, N. Y. C
Federal Electric Co., 6700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.
Flutelier. See Pass & Seymour.
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. ..... M C B
Garnor Elec. Co., Stratford, Conn. ..... A
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... M C K T P B A
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... M C K T P B A
Harter. See Multi Elecl. Mfg. Co.
Hoosick Falls Radio & Elec'l Parts Mfg. Co., Hoosick Falls, N. Y. ..... W
Horan Co., E. S., 550 Monroe, Carlstadt, N. J. ..... A
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 236 Greenpoint Ave., Brooklyn, N. Y. ..... M C K P B A
Levolier. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. ..... P B A
Multi Elec'l Mfg. Co., 1840 W. 14th, Chicago, Ill. ..... A
Multilok. See Circle F Mfg. Co.
National Bearing Metal Corp., Div. More-Jones Brass & Metal Co., 4930 Manchester Ave., St. Louis, Mo.
Newgard. See Multi Elec'l Mfg. Co.
New Wrinkle. See Bryant Elec.
Neark. See Colt's Patent Fire Arms.
P & S. See Pass & Seymour.
Pass & Seymour, Div. H, Solvay Sta., Syracuse, N. Y. ..... M C K T P B A
Paulding, John I., New Bedford, Mass. ..... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. ..... A
Quick Catch. See Hubbell, Inc.
Royal. See Sears, Henry D.
Ryan Appliance Co., 117 Mulberry, Trenton, N. J. ..... W A
Sears, Henry D., 80 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn. .....
Taplet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. ..... A
Titan. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. ..... A
Union Insul. Co., Parkersburg, W. Va. .....
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y. ..... P B W
U. S. Electric Co., 18 Chambers, Trenton, N. J. ..... A
Walco. See Leiser & Co., W. A.
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. ..... P
Wood Electric Co., C. D., 585 Broadway, New York (Slim Receptacles.) ..... A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

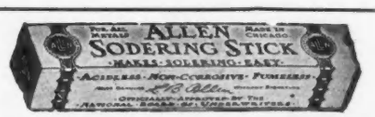
Federated Metals Co., 233 Broadway, New York, N. Y.
Lasher-Weeber Co., 261 Franklin, Boston, Mass.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Supreme. See Lasher-Weeber Co.
Usarco. See Federated Metals Co.

SOLDER, Bar and Wire

Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing

Dutch-Boy. See National Lead Co.



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National Lead Co., 111 Broadway, New York, N. Y.
Philadelphia Solder Co., 16th & Indiana Ave., Philadelphia, Pa.
Silva-Wares, Inc., 134 W. 26th St., New York, N. Y.
Solderall Co., 129 Sussex Ave., Newark, N. J.

SOLDER, Silver

Handy & Harman, 57 William, New York, N. Y.
Wilson Co., H. A., Newark, N. J.

SOLDERING

Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator
Pots. See Melting Pots & Ladles.
Tools. See Torches and Furnaces.

SOLDERING COMPOUNDS

Stick Paste, Flux Salts, Fluid.
Allen Co., Inc., L. B., 6752 Bryn Mawr Ave., Chicago, Ill. (Stick Paste, Salts, Aluminum Flux, Fountain Brushes.)
Amco. See American Solder & Flux Co.
American Solder & Flux Co., 2910 N. 16th, Philadelphia, Pa.
Armstrong Ke-Ti Products Co., 491 N. Front, Columbus, O.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.
Burnley Battery & Mfg. Co., North East, Pa. (Paste and Stick.)
Brubner Chemical Wks., 217 E. 3rd, Cincinnati, O.
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Chase Brass & Copper Co., 236 Grand, Waterbury, Conn.
Conductalute. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Firth Radio Corp., 25 Beaver, New York, N. Y.
Fluxite. See Monarch Products Co.
General Elec. Co., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
Kester Solder Co., 4210 Wrightwood Ave., Chicago, Ill.
Leveridge, Inc., Chas. W., 246 Fulton, New York, N. Y.
Lotan Research Corp., 6545 Euclid Ave., Cleveland, O.
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co., 5716 Euclid Ave., Cleveland, O.
Perfecto. See Firth Radio Corp.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste, Salts, Sticks, Fluid, Oil, and Solid Sal Ammoniac.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., 133 Hoboken Ave., Jersey City, N. J. (Fluids, Salts, Paste).
Redina. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., Bathgate Place, Newark, N. J.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Salbrick. See American Solder & Flux Co.
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. (Paste.)
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Speco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co.
Superior. See Highland Electro Chemical Co.
Technical Products Co., 2308 Main, Pittsburgh, Pa. (Paste.)
Tinol. See American Solder & Flux Co.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex. R.
Yankee. See Leveridge, Inc., Chas. W.

SOLDERING IRONS

Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Adroit. See Adrola Corp.
Adrola Corp., Port Jefferson, N. Y.
American Beauty. See American Elecl. Heater Co.
American Elecl. Heater Co., Woodward & Burroughs Ave., Detroit, Mich.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beckwith Machine Co., 402 Chestnut, Ravenna, Ohio.

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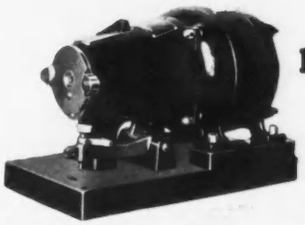

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SOLDERING IRONS—Continued
Betsy Ross. See Central Flatiron Mfg. Co.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 712 Ontario Ave., W., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland (Transformer Soldering Outfit.)
Electric Soldering Iron Co., Inc., 135 W. 17th, New York City.
Elmeg. See Electrical Necessities Corp.
Elsco. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
King. See Electric Heat Control Co.
Koch Co., Paul W., 19 S. Wells, Chicago. (Solder Dipper.)
Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lotan. See Simplex Flux & Solder Co. of America.
Lucifer. See Jones Point Tool & Elec. Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass.
National Specialties Co., Howell & Tyler Sts., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson-United Corp., Probert, Rochester, N. Y.
Simplex Div. of Edison General Elec. Appliance Co., Inc., 5500 W. Taylor, Chicago, Ill.
Simplex Flux & Solder Co. of America, 1965 E. 66th, Cleveland, O.
Sta-Warm. See Beckwith Machine Co.
Superior Elec. Products Corp., 1300 S. 13th, St. Louis, Mo.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trent, Harold E., 439 N. Twelfth, Philadelphia, Pa.
Varick Elec. Mfg. Co., 28 E. 21st St., New York, N. Y.
Vulcan Elec. Heating Co., 225 Varick, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Mfg. Co., Torrington, Conn.

SOLDERING MACHINES, Commutator
(For production soldering of small commutators).
Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.

SOLENOIDS. See Coils
SOLVENTS & REDUCERS, VARNISH. See Paint, Varnish, Lacquer.
SPAGHETTI. See Tubing, Varnished Fabric.
SPEED CHANGING UNITS. See Gears (Speed Changing Units).
SPEED INDICATORS. See Tachometers.
SPEED REDUCERS. See Gears, Speed Changing Units
SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

SPRAYING OUTFITS
Airmode. See Reliable Mfg. Co.
Airway. See Binks Spray Equip. Co.
Atomizer Corp., 21 Hamilton, Rahway, N. J.
Beach Air Brush Co., Willard C., Second & Warren, Harrison, N. J.
Binks Mfg. Co., 3114 Carroll Ave., Chicago, Ill.
Breuer Electric Mfg. Co., 852 Blackhawk, Chicago, Ill.
De Vilbiss Co., 3750 Detroit Ave., Toledo, Ohio.
Eclipse Air Brush Co., 1355 Shield Ave., Newark, N. J.
Eisler Electric Corp., 770 S. 13th St., Newark, N. J.
Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind.
Eureka Sprayers, Inc., 87-28 130th, Richmond Hill, N. Y.
Gast Mfg. Corp., Bridgman, Mich.
Globe Mfg. Co., Battle Creek, Mich.
Hobart Mfg. Co., Simpson & Penn Sts., Troy, Ohio.
Hurley. See Binks Mfg. Co.
Ideal Air Brush Mfg. Co., 270 Lafayette, New York, N. Y.
Kellogg Mfg. Co., 97 Humboldt, Rochester, N. Y.
Koch Bros. Mfg. Co., 2339 Nelson, Chicago, Ill.
K B. See Koch Bros. Mfg. Co.
Metal Specialties Mfg. Co., 338 N. Kedzie Ave., Chicago.
Macleod Co., 2232 Rogen, Cincinnati, O.
Matthews Corp., W. N., 3722 Forest Park Blvd., St. Louis, Mo.
Paasche Air Brush Co., 1909 Diversey Parkway, Chicago, Ill.
Paint-O-Mister. See Atomister Corp.
Pioneer Air Compressor Co., 243 Canal, New York, N. Y.
Presto. See Metal Specialties Mfg. Co.
Reliable Mfg. Co., Dwightway & Fourth St., Berkeley, Cal.
Sharpe Mfg. Co., 1356 S. Flower, Los Angeles, Cal.
Simons Paint Spray Brush Co., 17 Maryland Ave., Dayton, O.
Simplex Spray Equipment Co., 552 W. Lake, Chicago, Ill.
Spraco, Inc., Somerville, Mass.
Spray-All. See United States Air Compressor Co.
Sprayit. See Electric Sprayit Co.
United States Air Compressor Co., 5300 Howard Ave., Cleveland, O.
Wold Air Brush Mfg. Co., 2173 N. California Ave., Chicago, Ill.

SPREADERS, COIL & LOOP. See Winding Machines, Armature & Field Coil.

SPRING MAKING MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS
Advance Spring & Wire Co., Carroll Ave. & Wood St., Chicago.
American Coil Spring Co., Muskegon, Mich.
American Spiral Spring & Mfg. Co., Arsenal Sta., Pittsburgh, Pa.
American Spring & Mfg. Co., Holly, Mich.
Barnes Co., Wallace, Bristol, Conn.
Barnes-Gibson-Raymond, Inc., 6400 Miller Ave., Detroit.
Cary Spring Works, Inc., 240 W. 29th St., New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Eureka Tinware Mfg. Co., 135 W. 20th, New York, N. Y.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Flexo Spring Mfg., Inc., 34 South First, Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Humason Mfg. Co., Forestville, Conn.
Hunter Pressed Steel Co., Lansdale, Pa.
Kokomo Spring Co., Kokomo, Ind.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Mattatuck Mfg. Co., Waterbury, Conn.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Newcomb Spring Corp., 234 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1660 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Raymond Mfg. Co., Corry, Pa.
Standard Spring and Manufacturing Co., 236-42nd St. Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Yost Superior Co., Springfield, O.
Young Industries, Inc., L. A., Detroit, Mich.

STAMPED BOXES. See Cabinets, Sheet Steel.

STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel
Heavy Stamping and Drawing.
Acklin Stamping Co., 1925 Nebraska, Toledo, O.
American Stamping Co., 978 E. 64th, Cleveland, O.
Bartlett-Thompson Co., 67 Sudbury, Boston, Mass.
Benjamin Mfg. Co., Des Plaines, Ill.
Bossert Corp., 1002 Oswego St., Utica, N. Y.
Challenge Stamping & Porcelain Co., Grand Haven, Mich.
Detroit Metal Specialty Co., 1651 Beard, Detroit, Mich.
Eureka Tinware Mfg. Co., 135 W. 20th, New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, 1392 St. Paul Ave., Milwaukee.
Hubbard & Co., 6301 Butler, Pittsburgh, Pa.
Hunter Pressed Steel Co., Lansdale, Pa.
Janney, Jr., Joseph A., 1421 Chestnut St., Philadelphia
Lansing Stamping Co., Lansing, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metal Specialty Co., 1553 Riverside Drive, Cincinnati, O.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mignon Elec. Corp., 909 Genesee, Buffalo, N. Y.
Mullins Mfg. Corp., Salem, Ohio. (Vitreous Enameled.)
New England Pressed Steel Co., Natick, Mass.
Seymour Products, Seymour, Conn.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Truscon Steel Co., Youngstown, O.
United States Stamping Co., Moundsville, W. Va.

STAMPINGS, Small
Small Stamped Metal Parts for Electrical Devices.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
American Stamping Co., 978 E. 64th, Cleveland, O.
Arrow Automatic Products Corp., 27 Vestry, New York, N. Y.
Barnes Co., Wallace, Bristol, Conn.
Beaver Mfg. Co., 525 N. Third, Newark, N. J.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Chase Brass & Copper Co., Waterbury, Conn.
Cinch Mfg. Corp., 2335 W. Van Buren, Chicago, Ill.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Detroit Metal Specialty Co., 1651 Beard, Detroit, Mich.
Diamant & Tool Mfg. Co., 401 Mulberry, Newark, N. J.
Elco Tool & Screw Corp., 1818 Broadway, Rockford, Ill.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, 1392 St. Paul Ave., Milwaukee.
Gramines & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Plano, Ill.
Great Lakes Pressed Steel Corp., 1410 Niagara, Buffalo, N. Y.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Humason Mfg. Co., Forestville, Conn.
Hunter Pressed Steel Co., Lansdale, Pa.
Imperial Electrical Co., Union City, Ind.
Klein Elec. & Mfg. Co., 14½ Young, Tonawanda, N. Y.
Krischer's Mfg Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mattatuck Mfg. Co., Waterbury, Conn.
McDowell Mfg. Co., Millvale Sta., Pittsburgh, Pa.
Mechanics Tool & Stamping Co., 7 Summer, Worcester, Mass.
Melaun Mfg. Co., 144 E. Morris, Indianapolis, Ind.
Mignon Elec. Corp., 909 Genesee, Buffalo, N. Y.
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
Mutual. See Bull Dog Elec. Products Co.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Precision Metal Workers, 3100 Carroll Ave., Chicago, Ill.
Premax Products, Inc., 230 Tenth, Niagara Falls, N. Y.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Ribayseu Mfg. Co., J., 4442 Roosevelt Rd., Chicago, Ill.
Risdon Mfg. Co., Naugatuck, Conn.
Russell Mfg. Co., John M., Naugatuck, Conn.
Schollhorn Co., Wm., New Haven, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sharples Separator Co., Riddle & Patten Ave., Westchester, Pa.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Signal Elec. Mfg. Co., Menominee, Mich.
Soss Mfg. Co., Roselle, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
United States Stamping Co., Moundsville, W. Va.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co. (Elecl. Mfg. Div.), Waterbury, Conn.
Western Cartridge Co., East Alton, Ill.
Zierick Machine Wks., F. R., 68 E. 131st St., New York, N. Y.

STANDS, Armature
Columbia Machine Works & Malleable Iron Co., 263 Chestnut, Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Onan, David W., 43 Royalstene Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
Wetzenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).
STEATITE. See Cores, Resistance Coil.
STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances
Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Ludlum Steel Co., Watervliet, N. Y.
Reed Co., Jr., David, 85 Adams, Brooklyn, N. Y.
Swedmag. See Reid Co., Jr., David.

STEEL SHEETS
Agathon. See Republic Iron & Steel Co.
Allegheny Steel Co., Brackenridge, Pa.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armco. See International Corp., Middletown, O.
Armelec. See Empire Steel Corp.
Cyclops Steel Co., Titusville, Pa.
Dynelec. See Empire Steel Corp.
Empire Steel Corp., Mansfield, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Follansbee Bros. Co., Third & Liberty, Pittsburgh, Pa.
Manelec. See Empire Steel Corp.
Metelec. See Empire Steel Corp.
Newport Rolling Mill Co., Newport, Ky.
Poielec. See Empire Steel Corp.
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Tranelec. See Empire Steel Corp.
Unilov. See Universal Steel Co.
Universal Steel Co., Bridgeville, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers
Hall-Will, Inc., Twelfth & Cranberry, Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator
Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., 260 Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel
Angle Steel Stool Co., Plainwell, Mich.
Chicago Wire Chair Co., 612 N. La Salle, Chicago, Ill.
Royal Metal Mfg. Co., 1140 South Michigan Ave., Chicago.

STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separaters.
Tools. See Tools, Storage Battery.
STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft
Columbia Machine Works & Malleable Iron Co., 263 Chestnut, Brooklyn, N. Y.
STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL
(Hot and Cold Roll).
Acme Steel Co., 2832 Archer Ave., Chicago, Ill. (Hot & Cold).
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. (Cold).
Athenia Steel Co., 135 William, New York, N. Y. (Cold.)
Barnes Co., Wallace, Bristol, Conn. (Hot.)
Griffin Mfg. Co., Huron & Cheery, Erie, Pa. (Cold.)
Laclede Steel Co., Arcade Bldg., St. Louis, Mo. (Hot.)
Latrobe Electric Steel Co., Latrobe, Pa. (Hot & Cold.)
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Sharon Steel Hoop Co., Sharon, Pa. (Hot.)
Stanley Wks., New Britain, Conn. (Hot & Cold.)
Steel and Tubes, Inc., Cleveland, O. (Hot & Cold.)
Superior Steel Corp., 3122 Grant Bldg., Pittsburgh, Pa. (Hot & Cold.)
Thomas Steel Co., Warren, Ohio.
West Leechburg Steel Co., Farmers Bank Bldg., Pittsburgh, Pa. (Hot & Cold.)

STRIPPERS, Wire
Acme. See A. Laubscher.
Artos Engineering Co., 115 Brown, Milwaukee, Wis. (Cutting, Stripping and Measuring).
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Carlander, Henry, 508 W. 146th, New York, N. Y.
Colonial-Premier Co., 229 W. Ohio, Chicago, Ill.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
E-Z. See Pyramid Products Co.
F F. See France Mfg. Co.
France Mfg. Co., 10306 Berea Rd., Cleveland. (Motor Driven.)

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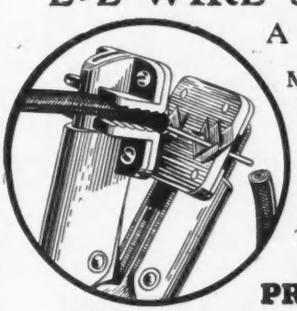

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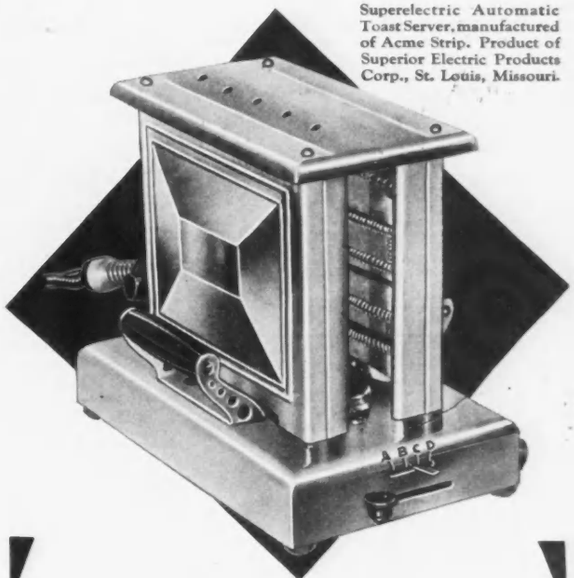
Small Metal Stampings Accurately Made

PATTON-MacGUYER CO. — Providence, R. I.



Superelectric Automatic Toast Server, manufactured of Acme Strip. Product of Superior Electric Products Corp., St. Louis, Missouri.

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for Electrical Manufacturing

Acme Strip is rolled to meet the most exacting requirements, and every ton of steel is inspected for temper, surface, edge conditions, thickness and width variations. A full range of sizes of both hot and cold rolled is furnished in long length coils or straight lengths, for stamping, forming and deep drawing.

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SAN FRANCISCO
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31

STRIPPERS, Wire—Continued
Goebel. See Klein & Sons.
Hertman. See Service Sales & Mfg. Co.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Perfection. See Weber Machine Corp.
Pyramid Products Co., 2311 S. State, Chicago, Ill.
Service Sales & Mfg. Co., 3405 W. 159th, Cleveland, O.
speedcraft. See Wire Stripper Co.
Thomas Steel Products Co., Warren, Ohio.
Weber Machine Corp., Rochester, N. Y.
Wire Stripper Co., 507 Erie Bldg., Cleveland, O. (Motor Driven Wire Stripper & Wire Twister.)
Zierick Machine Wks., F. R., 68 E. 131st, New York City. (Motor Driven Stripper & Twister).

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

SWITCHBOARD OPALS. See Lenses.

SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Rèversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

SWITCHES, Battery and Baby Knife
Cut-Out Switches.
Anti-Wood. See Keil & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
General Electric Vapor Lamp Co., 889 Adams, Hoboken, N.J.
Jefferson Electric Co., 1503 S. Laflin, Chicago, Ill.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Crown. See Edwards & Co., Inc.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Div.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Trenton, N J.
Jefferson Elec. Co., 1500 S. Laflin, Chicago, Ill.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Keil & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland
Sta-Rite. See Frank W. Morse & Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury
(For Temperature Control Apparatus.)
Con-Tac-Tor. See Time-O-Stat Controls Co.
Dunco. See Struthers Dunn, Inc.
General Electric Vapor Lamp Co., 883 Adams, Hoboken, N. J.
General Kontrolar Co., 200 E. First, Dayton, O.
Hywatt. See Time-O-Stat Controls Co.
Leland Electric Co., Dayton, O.
Kontax. See General Kontrolar Co. & Leland Electric Co.
Kontrolar. See General Kontrolar & Leland Electric Co.
Machlett & Son, 50 William, Long Island City, N. Y.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Safety Regulator Co., 529 S. Mayhews, Los Angeles, Cal
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.

SWITCHES, Motor Starting
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
Automatic Switch Co., 154 Grand, New York, N. Y.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y
Crouse-Hinds Co., Syracuse, N. Y.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Large-Dail Mfg. Co., 311 N. Tenth, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland O

Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nubiade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Robbins & Myers, Inc., Springfield, O.
Safelock. See Westinghouse Elec. & Mfg. Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
Switchfuz. See Adam Elec. Co.
S. S. See Wadsworth Elec. Mfg. Co.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.

SWITCHES, Remote Control
Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Switch Co., 154 Grand, New York, N. Y.
Automatic Temperature Control, 34 E. Logan, Philadelphia.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Darrin. See Automatic Switch Co.
Dunco. See Struthers Dunn, Inc.
Electric Valve Mfg. Co., 64 Murray, New York, N. Y.
General Electric Co., Merchandise Dept., Bridgeport, Conn
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Div. of Square Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Kato. See Automatic Elec. Mfg. Co.
Lincoln Elec. Co., Colt Rd. & Kirby Ave., Cleveland, O
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co
Ross Safety Switch Corp., 1 E. 42nd, New York, N. Y.
Signal Engineering & Mfg. Co., 154 W. 14th, New York.
South Bend Current Controller Co., 247 La Porte, South Bend, Ind.
States Co., 19 New Park Ave., Hartford, Conn
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

	KEY
Feed Through	See p
Fixture (Canopy, Candelabra and Key Arm)	See F
Flush	See f
Lever, Toggle, Tumbler	See L
Pendant	See p
Push Button	See P
Rotary	See R
Surface	See s

See Also Switches, Snap; Heavy Duty.
Adam Electric Co., Frank, St. Louis, Mo. f . . . . . .
Anylite Elec. Co., 200 Murray, Ft. Wayne, Ind.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . f sp P R L F
Arrow Head. See Arrow Elec.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. . . . . f p P . . . F
Best. See United States Elec. Mfg. Corp.
Brasscraft. See Guth & Co., Edwin.
Bremer Elec. Mfg. Co., 179 N. 7th, Philadelphia, Pa. . . . . f . . . . . .
Bridgeport Switch Co., 209 Center, Bridgeport, Conn. . . . . L F
Bryant Elec. Co., Bridgeport, Conn. . . . . f sp P R L F
B. S. Co. See Bridgeport Switch Co.
Carling Tool && Machine Co., 618 Capitol Ave., Hartford, Conn. . . . . F
Commercial. See Gaynor Electric Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. . . . . p P R L F
Crouse-Hinds Co., Syracuse, N. Y. . . . . L . .
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. . . . . P . . . L . .
Diamond H. See Hart Mfg. Co.
Dugie. See Bryant Elec. Co.
Gaynor Elec. Co., Stratford, Conn. . . . . f . . . . . L . .
General Elec. Co., Bridgeport, Conn. . . . . f sp P R L F
Glo-Guide. See Bryant Elec. Co.
Gold Star Push Switch. See Hart & Hegeman
Guth & Co., Edwin, 2625 Washington Ave., St. Louis, Mo. . . . . F
Hart Mfg. Co., Hartford, Conn. . . . . I sp P R L . .
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. (Door Bolt Control) f sp P R L F
Hart. See Hart & Hegeman.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Inc., Harvey, Bridgeport, Conn. . . sp . . . . L F
Keil & Son, Francis, 401 E. 163rd, New York, N. Y. . . . . f . . P . . . . .
Leviton Mfg. Co., 226 Newell, Brooklyn . . . . . F
Levolier. See McGill Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. . . . . f . . . . . L F
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y. . . . . L F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y. . . . . s . . . R . . .
Morse Co., Frank W., 291 Congress, Boston . . . P . . . . .
National. See Standard Elec. Mfg. Co.
New England. See Paulding, John L.
Nutmeg See Hubbell, Harvey, Inc.
Pass & Seymour, Div. H, Solvay Sta., Syracuse, N. Y. . . . . f sp P . . L F
Paulding, John I, New Bedford, Mass. . . . f s P . . . . .
Pen Tap. See Beaver Mfg. Co.
Perkins. See Bryant Elec. Co.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y. . . . . L . .
Pilotoggle. See Pilot Radio & Tube Corp.

Pilotoggle. See Pilot Elec. Mfg. Co.
Pullrite. See Morse, Frank W.
Rodale Mfg. Co., 200 Hudson, New York p . . . . . .
Sears, Henry D., 80 Boylston, Boston. . f sp P R L F
Smith & Co., T. C., 3915 Pewelton Ave., Philadelphia, Pa. . . . . P . . . . .
Snapit. See Marks Products Co.
Spartan. See Bryant Elec. Co.
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill. . . . . f p P R L .
Starite. See Morse Co., Frank W.
Trigie. See Bryant Elec. Co.
Tumbolier. See Hart & Hegeman.
Twi-Lite. See McGill Mfg. Co.
United States Elec. Mfg. Corp., 222 W. 114th, New York, N. Y. . . . . f . . . . . .
Victor See Keil & Son, Francis.
Washington. See Gaynor Electric Co.
Weber. See Sears, Henry D.
Yankee. See Bryant Elec. Co.

SWITCHES, Snap; Heavy Duty
Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Bryant Electric Co., 1421 State, Bridgeport, Conn.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., Kent, O.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Penn Electric Switch Co., E. 20th & Walnut Sts., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.

SWITCHES, Tank
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Schenectady, N. Y.
Industrial Controller Div. of Square Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn.
Penn Elec. Switch Co., 20th & Walnut, Des Moines, Ia.
Roberts & Kanze Elect. Repair Co., 240 W. 25th, New York.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SWITCHES, Time (Automatic Clock Operated Switches)
Anderson Mfg. Co., Albert & J. M., 189 A, Boston, Mass
Astrachron. See Gem Engineering Co.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal
Buckeye Time Switches, Inc., 1557 St. Clair Ave., Cleveland, O
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Electric Steam Radiator Co., 513 Stewart, Seattle, Wash
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
Gem Engineering Co., Hempstead, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Horni Signal Mfg. Co., 290 Hudson, New York, N. Y.
Horolectrical Corp., 216 W. 14th, New York, N. Y.
Jewel. See Time Switch Sales & Service.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich
Northwestern Clock Co., 515 Brown Bldg., Omaha, Neb
Paragon Elec. Co., 407 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Radio Owl, 2245 E. 51st, Los Angeles, Cal.
Radio Switchman. See R-V Mfg. Co.
Reliance Automatic Ltg. Co., 1925 Meads, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles
Robbins & Myers Co., Springfield, O.
Ross Safety Switch Corp., 1 E. 42nd, New York, N. Y.
R-V Mfg. Co., Marshfield, Mass
Sangamo Elec. Co., Springfield, Ill.
Sauter. See Cramer & Co.
Sentinel. See Electric Steam Radiator Co.
Stat-Amatic Instrument & Appliance Co., Hartford, Conn.
States Co., Hartford, Conn.
Stromberg Electric Co., 223 W. Erie, Chicago, Ill.
Thompson Clock Co., H. C., Bristol, Conn.
Time Switch Sales & Service, 1841 Euclid Ave., Cleveland.
York Clocks, Inc., 12 E. 41st, New York, N. Y.
Walser Automatic Timer Co., 405 Lexington Ave., New York (Also Coin Operated.)
X-L Radio Laboratories, 1224 Belmont Ave., Chicago, Ill.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS
Speed Indicators, Speedometers, Revolution Counters.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Durant Mfg. Co., 655 Buffum, Milwaukee, Wis.
Electric Tachometer Corp., Spring Garden & Broad St., Philadelphia, Pa.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Messner Mfg. Co., 226 E. Washington, Syracuse, N. Y.
Productimeter. See Durant Mfg. Co.
Strandco. See Sticht & Co.
States Co., 19 New Park Ave., Hartford, Conn.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elect. Instrument Co., 583 Frelinghuysen Ave., Newark, N. J.
Zernickow Co., O., 15 Park Row, New York, N. Y.

TAGS, Cable; Pole and Battery
American Radio Hardware Co., 135 Grand, New York, N. Y.
(Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brooklin Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Matthews & Co., Jas. H., 3942 Forbes, Pittsburgh, Pa.
Premax Products, Inc., 230 Tenth, Niagara Falls, N. Y.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co. (Elect. Mfg. Dept.), Waterbury Conn.

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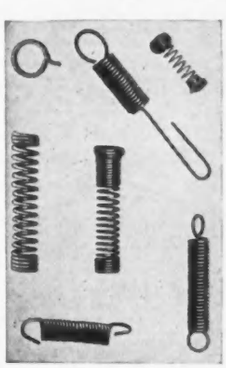

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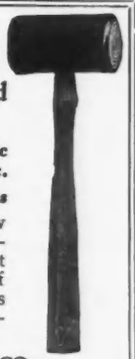

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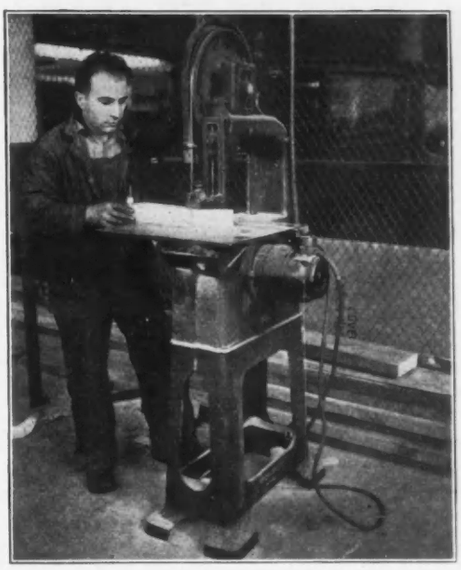

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TAGS, Shipping
Campbell Paper Box Co., 904 S. Main, South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.
TAMPING TOOLS, COIL. See Tools, Commutator Truing
TANK SWITCHES See Switches, Tank.
TANKS, OIL SWITCH & BREAKER. See Cabinets, Sheet Steel.
TANKS, TINNING. See Wire Manufacturing Machines.

TANTALUM
Fansteel Products Co., Inc., North Chicago, Ill.

TAPE, Asbestos
American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.
Matthews & Co., Jas. H., 3942 Forbes, Pittsburgh, Pa.
Micalite. See Mitchell-Rand Mfg. Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk;
Tape, Sleeving, Webbing.
Anchor Webbing Co., 300 Brook, Pawtucket, R. I. (Cotton, Silk).
Awebco. See Anchor Webbing Co.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony) Philadelphia, Pa.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Griscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica
Continental Diamond Fibre Co., Newark, Del.
Mica Insulator Co., 200 Varick, New York, N. Y.
Micalite. See Mitchell-Rand Mfg. Co.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction
Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Candee. See Ackurate Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear See Dryden Rubber Co.
Consumers Rubber Co., 1302 Ontario, N., Cleveland, O.
Coruco. See Consumers Rubber Co.
Criterion. See Consumers Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okonite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Firestone Tire & Rubber Co., Akron, O.
General Electric Co. Merchandise Dept., Bridgeport Conn.
Graybar Elec. Co., Graybar Bldg., New York, N. Y.
Grimshaw See New York Insulated Wire Co.
Grizzlite See Canfield Rubber Co.
Holfast Rubber Co., Atlanta, Ga.
Hoiditte. See United States Rubber Co.
Hydro-Proof See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York N. Y.
Impervo. See Canfield Rubber Co.
Irco. See Imperial Rubber Co.
Johnson & Johnson, New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.
Jomanco. See Johns-Manville Inc.
Jonflex. See Johnson & Johnson.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Manson See Okonite Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Non-El. See Consumers Rubber Co.
Okonite Co., Passaic, N. J.
O. K See Appleton Rubber Co.
R. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Rello. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
Sitco. See Superior Insulation Tape Co.
Slipknot. See Plymouth Rubber Co.
Star See Sullivan & Sons Mfg. Co., J.
Sticks. See Graybar Elec. Co.

Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambain Ave., St. Louis.
Z-Flex. See Holfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Usco. See United States Rubber Co.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Viter. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric
Cable Wire Co. New Haven, Conn.
Continental Diamond Fibre Co., Newark, Del.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Irv-O-Flatseme. See Irvington Varnish & Insulator Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Amboy Ave., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sitco. See Standard Insulation Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., 263 Chestnut, Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Midlon Company, Frank, Boston, Mass.
Seeger See Electric Service Supplies Co.
Seifert, E. R., 315 E. Washington, Syracuse, N. Y. (Automatic.)

TAPING MACHINES, Wire
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.
TAPS. See Stocks, Dies and Reamers.
TAP-ON DEVICES, Coil Wire. See Racks, Wire Reel

TENSION MACHINES, Band Wire
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

TERMINALS AND CONNECTORS
Low Tension, Secondary Terminals and Connectors.
All-in-One. See Ohio Parts Co.
Barcy-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Burton-Rogers Co., Boston, Mass.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 21 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
K. E. M. See Kutler Elec. Mfg. Co.
Kutler Elec. Mfg. Co. 575 Pierce Ave., Long Island City
Morse Co., Frank W., 291 Congress, Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Paton-MacGuyer Co., Providence, R. I.
Raish Co. Bloomfield, N. J.
Salem Elec'l Supply Co., 285½ Bridge, Salem, Mass.
Sherman Mfg. Co. H. B., Battle Creek, Mich.
Shuro. See Burton-Rogers Co.
Tinkerbox See Weber Elec. Wks.
Waterbury Button Co. (Elect. Mfg. Dept.), Watebury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.
Weldrite Tube Co., 1431 Central Ave., Detroit, Mich.
Zierick Machine Wks., F. R., 68 East 131st, New York.

TERMINAL BLOCKS
Penn Union Elec. Corp., Erie, Pa.

TEST BENCHES, Armature
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton-Rogers Co., Boston, Mass.
Cowie Electric Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Hobart Bros. Co., Troy, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Mike Company, 717 Sycamore Cincinnati, Ohio.
North East Appliance Corp., Rochester, N. Y.
Pearce & Stone, H. O. San Luis Obispo Cal.
Weidenhoff, Joseph, 4352 Roosevelt Road, Chicago, Ill.

TESTERS, Coil
(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
See See Weidenhoff Joseph.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., 2140 Wakeman, Toledo, Ohio.
Armeter See Chapman Electric Works, P. E.
Burton-Rogers Co., 857 Boylston, Boston, Mass.
Century Electrical Co., 100 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St. Louis Mo.
Cleveland Steel Products Corp., 7306 Madison Ave., Cleveland, O.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Commarometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland
Electrotest. See Comparometer Company.
Ev-Ri-Test. See Weidenhoff, Joseph.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 225 Varick, New York, N. Y.
Herald Elec. Co., 29 East End Ave., New York, N. Y.
Hobart Bros. Co., Troy, Ohio
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.

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Marshall Elec. Co., Elkhart, Ind.
Mike Company, 717 Sycamore, Cincinnati, Ohio.
North East Appliance Corp., Rochester, N. Y.
Oman, David W., 43 Royalstone Ave., Minneapolis, Minn.
Paneltest. See Allen Elec. & Equip. Co.
Portometer. See Allen Elec. & Equip. Co.
Portostat. See Allen Elec. & Equip. Co.
Presto. See Metal Specialties Mfg. Co.
Rex Batrystat. See Bartlett Products Co.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.
Scout. See Leich Electric Company.
States Co., 19 New Park Ave., Hartford, Conn. (Transformer Test Table)
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 Roosevelt Road, Chicago, Ill.
TESTING INSTRUMENTS. See Instruments.

TESTING LABORATORIES
Baker & Co., Inc., 54 Austin, Newark, N. J.
Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Rubicon Co., 29 N. Sixth. Philadelphia, Pa.
TESTING OVENS. See Ovens, Industrial and Laboratory.
THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL
Baker & Co., Inc., 54 Austin, Newark, N. J.
Chace Valve Co., W. M., 1608 Beard Ave., Detroit, Mich.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
General Plate Co. Attleboro, Mass.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Interstate Products Corp., 503 Mulberry, Newark, N. J.
National-Harris Wire Co., Newark, N. J.
Venbur. See Coffin Mfg. Co., B. F.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., Newark, N. J.

THERMOSTATS
Airswitch. See Time-O-Stat Controls Co.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bake-O-Meter. See Cooper Oven Thermometer Co.
Bak-Rite. See Electric Appliance Mfg. Co.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Coffin Mfg. Co., B. F., 30 Court, Newark N. J.
Cooper Oven Thermometer Co., Pequabuck, Conn.
Diamond H. See Hart Mfg. Co.
Dunco. See Struthers Dunn, Inc.
Electric Automatic Appliance Co., 1748 Arapahoe, Denver, Colo.
Electric Heat Control Co., 5903 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Freas Thermo-Electric Co. 1206 S. Grove Irvington, N. J.
General Electric Co., Schenectady, N. Y. (For Melting Pot.)
Globe Mfg. Co., Battle Creek, Mich.
Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 466 N. Pearl, Albany, N. Y.
Interstate Products Corp., 503 Mulberry, Newark, N. J.
King. See Electric Heat Control Co.
Klixon. See Westinghouse Electric & Mfg. Co.
Marvel See American Thermostat Co.
Mercoid Corp., 4201 Belmont Ave., Chicago, Ill.
Moeller Instrument Co., 261 Sumpter, Brooklyn, N. Y.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Mercoid Corp.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Sayutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Stat-Amatic Instrument & Appliance Co., Hartford, Conn.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Thermo-Intermediate Voltage
Trepte Co., L. R., 540 E. 9th, Portland, Ore.
Thermoelectric. See Bishop & Babcock Sales Co.
Time-O-Stat Controls Co., Elkhart, Ind.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.
Westinghouse Elec & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., Newark, N. J.

TIGHTENERS, Commutator
Elmes Engineering Works, Chas. F., 230 N. Morgan Chicago, Ill.
TIME SWITCHES. See Switches, Time.

TIN FOIL
Cobb Elec. Appliance Co., 100 Massachusetts Ave., Boston.
Lehnaier, Schwartz & Co., 521 W. 25th, New York, N. Y.
United States Foil Co., 30th & Grand Sts., Louisville, Ky.
TINNING TANKS, WIRE. See Wire Manufacturing Machines.
TINSEL. See Tinsel, Cord & Thread.

TINSEL, Cord and Thread
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Diamond Braiding Mills Chicago Heights, Chicago, Ill.
Empire Notion Co., 335 W. 35th, New York, N. Y.
Frank & Co., M. J., 15 W. 39th St., New York N. Y.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hy-Sil Mfg. Co., Revere, Mass.
Klip Co., 2 E. 23rd, New York, N. Y.

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TINSEL, Cord & Thread—Continued
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia
Lees Mfg. Co., 320 Broadway, New York, N. Y.
Montgomery Co., J. R., Windsor Locks, Conn.
Rockbestos Products Corp., 389 Nicoll, New Haven, Conn.
Springfield Wire & Tinsel Co., Springfield, Mass.

TIPS, Cord
Duro. See McEvoy, C. H.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
McEvoy Co., H., 430 Broadway, Lowell, Mass.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S. 180 S. Water, Providence, R. I.
Waterbury Brass Goods Corp., Waterbury, Conn.

TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Coil Tamping
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.

TOOLS, Commutator Truing
Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., 260 Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery
Battery Tools Co., 29 Willow, Montclair, N. J.
Bobbett Elec. Mfg. Co., 4307 Cottage Grove Ave., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
Cleveland Steel Products Corp., 7306 Madison Ave., Cleveland, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
General Elec. Co., Schenectady. (Lead Burning Outfits.)
Heet-A-Knife. See Bobbett Elec. Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati (Terminals.)
Op-Al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.

TORCHES AND FURNACES
Acetylene, Alcohol, Gasoline, Kerosene.
Always Reliable. See Otto Bernz Co.
Bernz Co., Otto, Newark, N. J.
Clayton & Lambert Mfg. Co., 6282 Beaubien, Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Weeber Co., 261 Franklin, Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Staysalite. See Klein & Sons, Mathias.
TORPEDO Cord. See Twine.
TORSION BALANCES. See Instruments, Laboratory Standard
TRANSFORMERS
Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Low & Inter-

TRANSFORMERS, Low and Intermediate Voltage
For Oil Burners, Gas Tube Signs, and other special purposes.
American Roach Magneto Corp., Springfield Mass.
American Transformer Co., 178 Emmet, Newark, N. J.
Campbell Elec. Mfg. Co., 15 Stewart, Lynn, Mass.
Concourse Electric Co., 324 E. 137th, New York, N. Y.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Eisler Electric Corp., 770 S. 13th St., Newark, N. J.
Forjos. See Motorless D. C. Neon Sign Co.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Jefferson Electric Co., 1500 S. Laflin, Chicago, Ill.
K-W Ignition Corp., 2811 Chester Ave., Cleveland, Ohio.
Kenyon Transformer Co., 122 Cypress Ave., New York, N. Y.
Mignon Elec. Corp., 909 Genesee, Buffalo, N. Y.
Motorless D. C. Neon Sign Co., 180 E. 123rd, New York. (Neon.)
Palmer Corp., Chas., 786 Broad, Newark, N. J.
Power Transformer Co., 145 W. 22nd, New York, N. Y.
Sorgel Electric Co., W. Water, Milwaukee, Wis.
Standard Transformer Co., Dana Ave., Warren, O
Uptigraff Mfg. Co., R. E., First National Bank Bldg., Pittsburgh, Pa.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Weber Electric Co., Racine, Wis.
TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power
Controller drive giving a variety of speeds for use in connection with coil taping machines.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.
TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.
TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel
Angle Steel Stool Co., Plainwell, Mich.
TRUING Devices, Commutator. See Tools, Commutator.
TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Aluminum. See Aluminum.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Nickel. See Tubing, Brass & Copper.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Porcelain. See Porcelain.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores: Sleeves. Bushings
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Climax Tube Co., Mystic, Conn.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
Klimaxcore. See Climax Tube Co.
Mc Lausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Paper Tube Co., 1718 N. Damen Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Stone Paper Tube Co., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper
American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
Baltimore Tube Co., 1301 Wicomico, Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
Bull Dog. See National Elec. Products Corp.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
Cook, Plumber Smith Co., 85 Sprague, Providence, R. I.
Dallas Brass & Copper Co., Div. of Revere Copper & Brass, Inc., 820 Orleans, Chicago, Ill.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
Michigan Copper & Brass Co., Div. of Revere Copper & Brass, 5851 W. Jefferson Ave., Detroit, Mich.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
National Elec. Products Corp., Pittsburgh, Pa.
National-Harris Wire Co., Newark, N. J.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Brass & Copper Co., Rome, N. Y.
Rome Hollow Wire & Tube Co., Div. of Revere Copper & Brass, Inc., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Summerill Tubing Co., Bridgeport, Pa. (also Nickel)
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic
(Flexible Tubing.)
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Hose Co., Waterbury, Conn.
American Metal Moulding Co., Irvington, N. J.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Auto-Brassflex. See National Elec. Products Corp.
Auto-Steeliflex. See National Elec. Products Corp.
Breeze Corp., Inc., 34 S. 6th, Newark, N. J.
Eisler Electric Corp., 770 S. 13th St., Newark, N. J.
Flexo Spring Mfg. Inc., 54 South First, Brooklyn, N. Y.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Time-O-Stat Controls Co., Elkhart, Ind.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co. (Industrial Div.), S. S., 152 W. 42nd, New York, N. Y.

TUBING, Rubber
Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Canfield Rubber Co., 702 Railroad Ave., Bridgeport, Conn.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Faultless Rubber Co., Ashland, O.
Goodrich Rubber Co., B. F., Akron, O.
Rubber-Vac. See Eisler Electric Corp.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.

TUBING, Varnished Fabric
Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Wire Corp., 520 Broadway, New York, N. Y.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Continental Diamond Fibre Co., Newark, Del.
Empire. See Mica Insulator Co.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.
TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.
TURNING TOOLS, COMMUTATOR. See Tools, Commutator Truing.

TWINE, Armature Winding; Torpedo Cord
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Wirne & Son, Frank W., 42 N. Front, Philadelphia, Pa.
UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.
UNITS, Refrigerator Condenser. See Condenser Units, Refrigerator

UNITS, Rods and Grids, Resistance
Acme Elec. Heating Co., Dept. B, 1217 Washington, Boston.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Electric Heater Co., 1524 Race, Philadelphia, Pa
Bradleyunit. See Allen Bradley Co.
Buffalo Products Co., Broome & Lafayette Sts., New York
Burger, J. P., 1813 Columbus Rd., Cleveland, O
Calrod. See Edison General Elec. Appliance Co., Inc
Chromalox. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 8E Holten, Danvers, Mass
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Monmouth, Jersey City, N. J.
Dur-ristor. See Cutler-Hammer, Inc.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Edgerst. See Industrial Controller Div.
Edgewound. See Monitor Controller Co.
Edison General Electric Appliance Co., Inc., 5600 W. Taylor, Chicago, Ill.
Edgewound. See Monitor Controller Co. & Clark Controller Co.
Elec. Controller & Mfg. Co., 2700 E. 79th, Cleveland, O
Elemite. See Louthan Mfg. Co.
Erie Resistor Corp., 644 W. Twelfth, Erie, Pa.
Fitz-All. See Rodale Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.

Hance-Parker Mfg. Co., 397 West Main, Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hardwick, Hindle, Inc., 216 Emmett, Newark, N. J.
Hexwound. See Monitor Controller Co.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Industrial Heater Co., 300 Canal, New York, N. Y.
Krischer's Mfg. Co., 255 Calyer, Brooklyn.
Lautz Mfg. Co., 345 N. J. R. R. Ave., Newark, N. J.
Louthan Mfg. Co., East Liverpool, O.
Marks. Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y.
Monitor Edgewound. See Monitor Controller Co. & Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill
Ohmite Mfg. Co., 633 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-Al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Parker & Co., J. C., 407 Bulletin Bldg., Philadelphia, Pa
Poloron Elec. Mfg. Corp., 26 Waverly Pl., New York, N. Y.
Presto Products Co., 520 Broadway, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrotz. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Repairall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.
Sesco. See Automatic Electric Heater Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., 20 N. Water, Rochester, N. Y.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa
Super. See Northern Elec. Co
Superior Resistor Corp., 334 Badger Ave., Newark, N. J. (Radio)
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N. Y
Vitrohm. See Ward Leonard Elec. Co.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y.
Warren Elec. Appliance Co., Warren, Pa.
Watlow Elec. Mfg. Co., 1520 N. 23rd, St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York, N. Y. (Radio.)
Wiegand Co., Edwin L., 7530 Thomas Blvd., Pittsburgh, Pa
Wirt Co., 5221 Greene, Philadelphia, Pa.
VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.
VACUUM DRYING & IMPREGNATING OVENS. See Ovens, Industrial.

VALVES, Electrically Operated
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York
Automatic Temperature Control Co., 34 E. Logan, Philadelphia, Pa.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Crane Co., 836 S. Michigan Ave., Chicago, Ill.
Cutler-Hammer, Inc., 1288 St. Paul Ave. Milwaukee
Electric Steam Radiator Co., 8th Ave & Virginia, Seattle, Wash.
Electric & Valve Mfg. Co., 64 Murray, New York, N. Y.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
General Electric Co., Schenectady, N. Y.
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., Brooklyn, N. Y.
Michigan Metal Products Co., Battle Creek, Mich.
Nacco Mfg. Co., 1482 Clara Ave., St. Louis, Mo.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O
Nu-Way Water Heater Control, Inc., 368 Erie Bldg., Cleveland, O.
Preferred Utilities Mfg. Corp., 33 W. 60th, New York, N.Y.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Sentinel. See Electric Steam Radiator Co.
Tagliabue Mfg. Co., C. J., 18-83rd St., Brooklyn, N. Y.
Teagle Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Time-O-Stat Controls Co., Elkhart, Ind.
Victor. See Lunkenheimer Co.
Zeco. See Zisch Engineering Corp.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)
VARNISH. See Paint, Varnish, Lacquer.
VARNISHED TAPE. See Tape, Varnished Fabric.
VARNISHED TUBING. See Tubing, Varnished Fabric.
VOLT BOXES. See Instruments, Laboratory Standard.
VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.
VACUUM PUMPS. See Pumps, Vacuum.

VULCANIZERS, WIRE INSULATION
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works Co., Akron, Ohio.
WASHERS, FIBRE. See Fibre.

WASHERS, Lock
Washers, Non-Metallic. See also Gaskets, Fibre.
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
Hobbs Mfg. Co., Worcester, Mass.
Kantlink. See National Lock Washer Co., Positive Lock Washer Co., Mansfield Lock Washer Co., Reliance Mfg. Co. & American Nut & Bolt Fastener Co.
Keystone. See Positive Lock Washer Co.
Mansfield Lock Washer Co., Mansfield O.
Massachusetts Machine Shop, Inc. Boston, Mass.
National Lock Washer Co., 40 Hermon, Newark, N. J.
Positive Lock Washer Co., Ave. A & Miller, Newark, N. J.
Reliance Mfg. Co., Massillon, O.
Shakeproof Lock Washer Co., 2533 N. Keeler Ave., Chicago.
St. Louis Malleable Casting Co., 7701 N. Conduit Ave., St. Louis, Mo.

WASHERS, Metallic
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Hubbard Spring Co., M. D., Pontiac, Mich.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.

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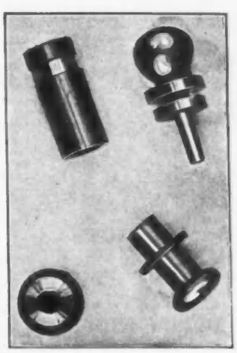

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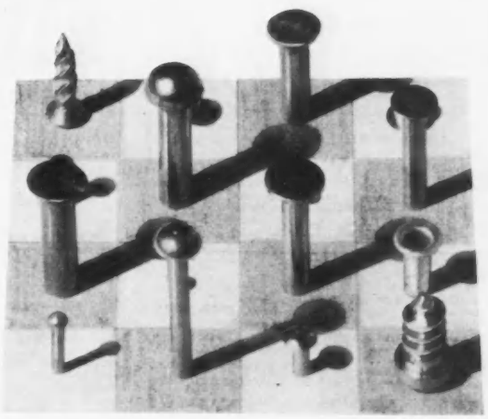

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Russell Mfg. Co., John M., Naugatuck, Conn.
United Screw & Bolt Corp., 2713 Cullerton, Chicago, Ill
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis
WATTMETERS. See Instruments.

WASHERS, Non-metallic
See also Gaskets, Fibre.
Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

WAX AND COMPOUNDS
Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound.....See C
Ackurate Rubber Co., 25 Beaver, New York, N. Y. W
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago.. S
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Biwax Corp., 208 S. La Salle, Chicago, Ill..... W S
Brand & Co., William, 268 Fourth Ave., New York, N. Y. W
Bulls-Eye. See Zinsser & Co.
Cablelene. See Vacuum Oil Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S
Cerowax. See Vacuum Oil Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston.... C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. W S
Dolph Co., John C., 168 Emmet, Newark, N. J. W
Di Electric Puttie. See Ackurate Rubber Co.
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Bridgeport, Conn..... W
George Co., P. D., St. Louis..... W
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O..... W S
Goldo Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., Div. of General Cable Corp., 5133 Wesson Ave., Detroit.. W
Hercules Powder Co., 975 Market, Wilmington, Del. (Wood Rosin) S
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York..... W
Insulation. See Vacuum Oil Co.
Knox & Morse Co., 80 Freeport, Boston, Mass..... W S
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind..... C
Mineralac Elec. Co., 1045 Washington Blvd., Chicago, Ill. W
Mitchell-Rand Mfg. Co., 19 Vesey, New York.... W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind.... W
National Wax Co., 189 W. Madison, Chicago, Ill.. S
Nu-Blac. See Star Porcelain Co.
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
Seidner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. W
Sherwin-Williams Co., Cleveland, O..... W C
Standard Varnish Wks., 433 4th Av., New York.. W
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. W S
Star Porcelain Co., Muirhead Ave., Trenton, N. J. W C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Indiana Trust Bldg., Providence, R. I. S
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. W S
Vacuum Oil Co., 61 Broadway, New York, N. Y. W
Warner-Quinlan Co., 2 Park Ave., New York, N. Y. C
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. S
Williams Co., F. M., 1288 Prospect Ave., Brooklyn, N. Y
Zinsser & Co., 48 Vesey, New York, N. Y. W
WEDGE DRIVERS. See Tools, Commutator.
WELDS, Lamp Lead-in. See Filaments, Incandescent

WELDING AND CUTTING OUTFITS
Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme Elec. Welder Co., 1850 W. Fulton, Chicago, Ill.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Co., Inc., 726 Washington, Buffalo
Almanc. See Allan Mfg. & Welding Co., Inc.
Alternarc. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago
Burke Electric Co., Erie, Pa.
Economy Electric Products Co., 2400 Woodland Ave., Cleveland, O.
Eisler Electric Corp., 770 S. 13th St., Newark, N. J.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Welding, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fleet-Weld. See Lincoln Elec. Co.
Flex-A-Weld. See Trumbull Elec. Mfg. Co.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y
Hansen. See Northwestern Mfg. Co.
Hobart Mfg. Co., Simpson & Penn Sts., Troy, Ohio
Hollup Corp., C. H., 3333 W. 48th Place, Chicago, Ill.
Lincoln Electric Co., Cott Rd. and Kirby Ave., Cleveland

Lundy Co., E. A., Fulton Bldg., Pittsburgh, Pa.
Macleod Co., 2232 Bogen, Cincinnati, O.
McAdams Co., J. C., New Britain, Conn.
Nigg Engineering Corp., Second St. & Covina Blvd., Covina, Cal.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Owen Elec. Mfg. Co., Fayetteville, N. C.
Plastic Arc. See Wilson Welder & Metal Co.
Pyrotip. See General Elec. Co.
Quasi-Arc, Inc., 11 W. 42nd St., New York, N. Y.
Rhason Mfg. Co., 124 45th, Union City, N. J.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Sellars Arc Welder Co., 1200 Fourth Ave., Seattle, Wash.
Seneca Electric Welder Corp., 5957 Woodward, Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., 2567 W. Grand Blvd., Detroit.
Taylor-Winfield Corp., Mahoning Ave., Warren, O.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Toledo. See Thomson-Gibb Elec. Welding Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Una Welding & Bonding Co., 1615 Commuer Ave., Cleveland, O.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Weldite. See Fusion Welding Corp.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Zeus. See Thomson-Gibb Elec. Welding Co.
WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WICKS, Lubricating
Brawley Felt Co., Inc., T. R., 279 20th, Brooklyn, N. Y.

WINDERS
Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.

WINDING MACHINES, Armature and Field Coil
Acme Elec. & Mfg. Co., 1447 Hamilton Ave., Cleveland, O.
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., 263 Chestnut, Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Conran, Frederick M., 107 Colden, Newark, N. J.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Eisler Electric Corp., 770 S. 13th St., Newark, N. J.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Herald Electric Co., 29 East End Ave., New York, N. Y
Hunsdorf, Wm., 2056 E. Fourth, Cleveland, O.
Liberty Starter Co., 241 Vinewood Ave., Detroit, Mich.
Meissner Mfg. Co., 522 S. Clinton, Chicago, Ill.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridion Co., Frank, 253 A St., Boston, Mass.
Secur. See Electric Service Supplies Co.
Seifert, E. R., 315 E. Washington, Syracuse, N. Y.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil
Acme Elec. & Mfg. Co., 1447 Hamilton Ave., Cleveland, O.
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Conran, Frederick M., 107 Colden, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J
Leesona. See Universal Winding Co.
Mignon Elec. Corp., 909 Genesee, Buffalo, N. Y.
Morris Register Co., 25th & Broadway, Council Bluffs, Iowa
Wadlo Production Machinery Co., 212 Centre, New York
Seifert, E. R., 315 E. Washington, Syracuse, N. Y.
Universal Winding Co., Boston, Mass.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Weehawken Engineering & Mfg. Co., 525 Gregory Ave., Weehawken, N. J.
WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory
Athey Co., 6142 West 65th St., Chicago, Ill.
WIRE (Cable) (Cord), Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire
Lamp & Tube Filament. See Filaments, Incandescent Lamp.
Magnet. See Wire, Insulated.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Strippers.
Strippers. See Strippers.
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare
Armature Banding.....See S
Copper Wire.....See C
Iron Wire.....See R
Phosphor Bronze.....See B
Radio Bus Wire.....See C
Resistance Wire.....See R
Steel Wire.....See S
Acme. See Alloy Metal Wire Co.
Alpha Wire Corp., 520 Broadway, New York.. C B
Advance. See Driver Harris Co.

Alloy Metal Wire Co., Moore, Pa..... C R
American Copper Products Corp., 233 Broadway, New York, N. Y. C B
American Electrical Works (Phillipsdale), Providence, R. I. C
American Steel & Wire Co., 208 N. La Salle.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y. C
Anylite Elec. Co., 200 Murray, Fort Wayne, Ind... C
Ballast. See Gilby Wire Co.
Baltimore Copper Mills, Div. of Revere Copper & Brass, Inc., Baltimore, Md. C
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y.
Belden Mfg. Co., 4633 W. Van Buren, Chicago..... C S
Bellville. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. B
Braidite. See Cornish Wire Co.
Brenvar. See General Cable Corp.
Bridgeport Brass Co., Bridgeport, Conn..... C
Calido. See Driver Harris Co.
Chase Brass & Copper Co., 236 Grand, Waterbury, Conn.
Chromel. See Hoskins Mfg. Co.
Chromic. See National-Harris Wire Co.
Climax. See Driver Harris Co.
Comet. See Driver Harris Co.
Cop Plate Co., Kew, N., 70 Ship, Providence, R. I. C
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. C B
Cornish Wire Co., 30 Church, New York, N. Y.. C
Corwico. See Cornish Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C
Cromin. See Gilby Wire Co.
Cupron. See Gilby Wire Co.
Dovis. See Chicago Insulated Wire & Mfg. Co.
Driver-Harris Co., Harrison, N. J. B
Electron. See Bassett Metal Goods Co.
Excellicr. See Branford Elec. Co.
Fullman Mfg. Co., Latrobe, Pa.
General Cable Corp., 420 Lexington Ave., New York C S
Gilby Wire Co., Riverside Ave., Newark, N. J. B
Goldsmith Co., James, 43 Warren, New York.. C
Hope Webbing Co., 1005 Main, Pawtucket, R. I. (Braided Wire Tape) C
Hoskins Mfg. Co., 4435 Lawton Ave., Detroit, Mich. B
Hudson Wire Co., Ossining, N. Y. C B
Ideal. See Driver Harris Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. C S
Karma. See Driver Harris Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C
Mayer. See Standard Alloy Wire Co.
National-Harris Wire Co., Newark, N. J. B
Nichrome. See Driver Harris Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. B
Peerless. See Alloy Metal Wire Co.
Phono-Electric. See Bridgeport Brass Co. & Standard Underground Cable Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C
Revolute Wire Co., Hastings-on-Hudson, N. Y.... C
Rice Co., A. H., Pittsfield, Mass. C
Roebling's Sons Co., John A., Trenton, N. J.... C B
Ross Wire Co., 69 Bath, Providence, R. I..... C
Seneca Wire & Mfg. Co., Fostoria, O. B
Silcrimp. See Valley Narrow Fabric Co.
Silectron. See Standard Alloy Wire Co.
Solar. See Gilby Wire Co.
Spargo Wire Co., J. A., Rome N. Y. C
Standard Alloy Wire Co., Div. of National-Harris Wire Co., Newark, N. J. B S
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therio. See Driver Harris Co.
Tophet. See Gilby Wire Co.
Two-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., 59 Chestnut, Central Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn. J
WIRE CLOTH. See Cloth, Wire.

WIRE, Copper Clad
Copperweld Steel Co., Glassport, Pa.
Eisler Electric Corp., 770 S. 13th St., Newark, N. J.
General Cable Corp., 420 Lexington Ave., New York, N. Y
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Wire Machinery Corp. of Am., New Haven, Conn.

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WIRE, Insulated

	KEY
Annunciator, Office, Bell Wire	See A
Asbestos Covered Heater Cord	See H
Asbestos Covered Magnet Wire	See M
Enameled Magnet Wire	See M
Fixture Wire	See B
Flexible Reinforced Heavy Duty Cord	See F

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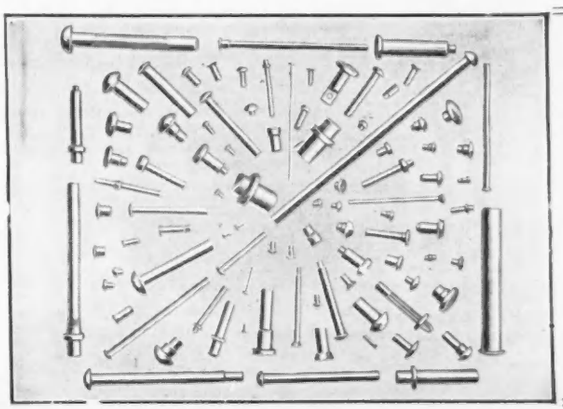

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Heater Cord ..... See H
Ignition Cable ..... See B
Lamp Cord ..... See B
Radio Cord ..... See B
Rubber Covered Wire & Cable.. See B
Stove Wire ..... See H
Telephone Cord ..... See T

AA. See General Cable Corp.
A-1 Brand. See General Cable Corp.
Amelectric. See American Elec. Wks.
American Braiding Co., Holyoke, Mass. R . . . . . .
American Copper Products Corp., 233 Broadway, New York, N. Y. . . . . .
American Electrical Works (Philipsdale), Providence, R. I. . . . . W L
American Insulated Wire Corp., 45 Baker, Providence, R. I. . . . . . R F . . A T . .
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. . . . . R F H A T . .
Americore. See American Steel.
Amerite. See American Steel.
Amerize. See American Steel.
Amparak. See American Steel.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y. . . . . . R F . . A . . .
Ansonia Electrical Co., Ansonia, Conn. (Silk Cotton Enameled) . . . . . A . . . .
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston. . . . . R . . . . . .
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill. . . . . R F H A T . .
Birnbach Radio Co., 254 W. 31st, New York, N. Y. . . . . R . . . . . .
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. . . . . . R F . . . . . .
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. . . . . . R F H . . . . .
Cablex. See Collyer Insulated Wire Co.
Celatsite. See Acme Wire Co.
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Tubular Woven Fabric Co., Pawtucket, R. I. . . . . . R F . . . . . .
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Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. . . . . . R F H . . T . .
White, J. M., 1128 Olive, Philadelphia, Pa. . . . . R F H . . T
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y. . . . . . R . . H . . . . .

WIRE, Magnet

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Alpha Wire Corp., 520 Broadway, New York, N. Y.
Amalite See Direct Line Telephone Co.
American Electrical Works (Philipsdale) Providence, R. I.
American Enameled Magnet Wire Co., Muskegon, Mich.
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Anaconda Wire & Cable Co., Maring Wire Branch, Muskegon, Mich.
Ansonia Electrical Co., Ansonia, Conn.
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Celatsite. See Acme Wire Co.
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
Ducatto. See General Cable Corp.
General Cable Corp., 420 Lexington Ave., New York, N. Y.
Enamelite See Acme Wire Co.
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Goldmark Co., James, 83 Warren, New York, N. Y.
Holyoke Co., 621 Broadway, New York, N. Y.
Inland Wire & Cable Co., Sycamore, Ill.
Kilo Co., 2 E. 23rd, New York, N. Y.
Massachusetts Electric Mfg. Co., West Lynn, Mass.
National Electric Products Corp., Pittsburgh, Pa.
New England Electrical Works, Lisbon, N. H.
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Rockbestos Products Corp., New Haven, Conn.
Roebling's Sons Co., John A., Trenton, N. J.
Strand & Sweet Mfg. Co., Winsted, Conn.
Sweetstrand. See Strand & Sweet Mfg. Co.
Varflex Co., Rome, N. Y.
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Winsted Insulated Wire Co., Winsted, Conn.
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Crescent. See Royle & Sons, John.
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Nebutteo. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. . . . . . I A B M S U . .
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Robertson Co., John, 121 Water, Brooklyn, N. Y. . . . . A . . . . . .
Royle & Sons, John, Paterson, N. J. I . . . . . .
Sleeper & Hartley, Inc., Worcester, Mass . . . . . A . . . S U
Terkelsen Machine Co., Terkelsen Bldg., Boston, Mass. . . . . . M . . . . .
Textile Machine Works, Reading, Pa. . . . B . . . . . .
Universal Wire Machy. Co., 69 Dagnett, New Haven, Conn. . . . . . A . . . . . U F
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Watson Machine Co., 74 Railroad Ave., Paterson, N. J. . . . . . I . . . . . .
Wire Machinery Corp. of Am., New Haven, Conn. . . . . M S U . .
Weir. See Housatonic Machine

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
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New England Butt Co., 324 Pearl, Providence, R. I.

WIRE, Steel Flat

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American Steel & Wire Co., 208 S. La Salle, Chicago, Ill
Crescent Insulated Wire & Cable Co., Trenton, N. J.
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Seneca Wire & Mfg. Co., Fostoria, O.

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Shuster Co., P. B., New Haven, Conn.
Seifert, E. R., 315 E. Washington, Syracuse, N. Y.

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WIRE & VULCANIZING MACHINES. See Vulcanizers

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Boxes. See Cabinets & Boxes, Wood
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Pulleys. See Pulleys, Composition
Woods Metal See Radio Mountings.

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WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.

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Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkalip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

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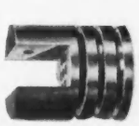

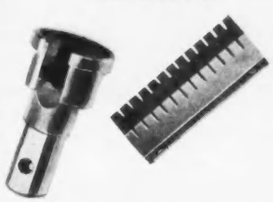

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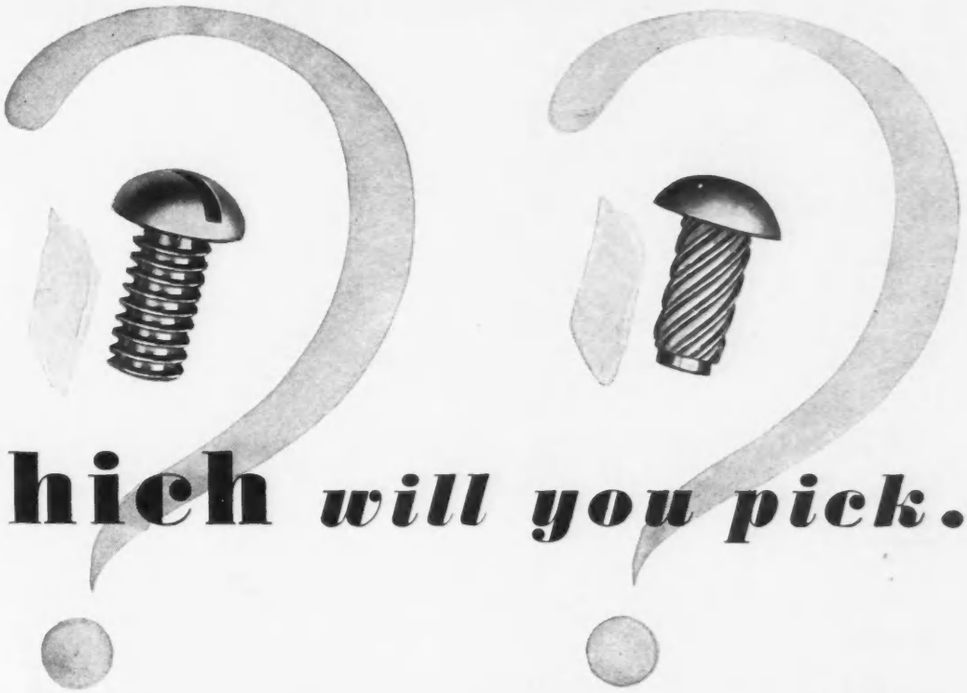

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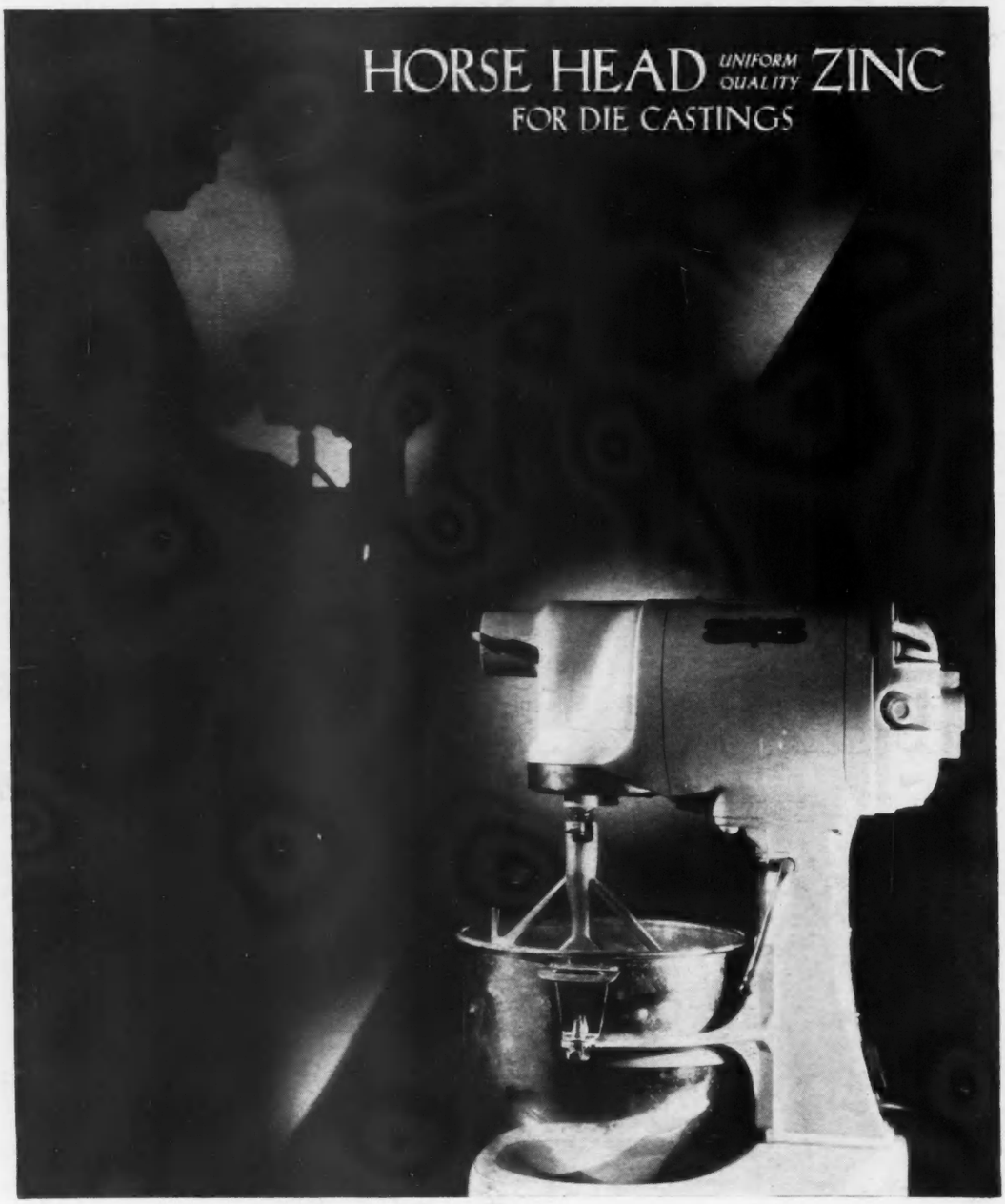
Drive Screws
PAT. JAN. 29, 1924-No. 1482151-OTHERS PENDING



The kitchen aid; parts (including the motor housing and end pieces) are die cast from an alloy of Horse Head Zinc

"COME OUT OF THE KITCHEN" sings this die cast labor saver to the housewife . . . . ¶ Die castings are also industrial labor savers. Cast to close tolerances, they eliminate much machining. Flexible in design, they eliminate excess parts. . . . ¶ And made from alloys of Horse Head *uniform quality* Zinc (as a majority of them are) they give the rugged, long-life service so necessary when labor saved is to become profit gained.

New Jersey Zinc

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET, NEW YORK CITY

Zinc Metal and Alloys ▪ *Rolled Zinc* ▪ *Zinc Pigments* ▪ *Sulphuric Acid* ▪ *Spiegeleisen*